Doc. No. 033-600004
CAGE CODE: 9M715
REV. A
FEBRUARY 21, 2001

DAS Data Requirement 6

Demand Access System (DAS) System/Subsystem Specification

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REVISION STATUS

Revision	Description	Date	Approval
	Released per ECF-AQ0006	10/24/2000	W. Kearns
A	Released per ECF-AQ0034	2/21/2001	W. Kearns

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

LIST OF FIGURES

1 INTRODUCTION

1.1 BACKGROUND

The purpose of the Demand Access System (DAS) is to allow expansion of the Tracking and Data Relay Satellite System (TDRSS) Multiple Access Return (MAR) capabilities. The DAS will build on the Third Generation Multiple Access Beamformer Subsystem (TGBFS) development by adding demodulation functions, global system control and coordination functions and data distribution capabilities.

The existing Tracking and Data Relay Satellites (TDRSs) provide pre-scheduled communication services to Customers by using ground-based electronics to process signals emanating from Customer platforms that are relayed by the TDRS MA on-board phased array antenna systems. DAS will be designed to support a variety of Customers including low-earth orbiters, atmospheric and ground-based and will support the following services: continuous, periodic, polling, formation flying, SOS, intermittent/on-demand.

1.2 SCOPE

This document will specify the implementation contractor's (ITT AES-Reston) detailed system requirements for the DAS. The DAS System/Subsystem Specification will describe the system architecture and include the following requirements:

- Functional
- Performance
- External Interfaces
- Operational
- Reliability, Maintainability, and Availability (RMA)
- Physical and Environmental
- Security
- Human Engineering and Safety
- Operations and Maintenance (O&M)
- Integrated Logistics Support

The System/Subsystem Specification will reflect the implementation contractor's system design for DAS by providing the allocation of system requirements to each DAS Subsystem. In that manner, traceability of requirements from the system-level to the subsystem will be provided.

The Subsystem Specifications are shown in italics following the system specification, as applicable.

This document addresses the DAS System requirements obtained from the allocation and the derivation of requirements presented in the DAS SRD. This document contains the following information:

- Section 1 contains the purpose, scope, and applicable documents associated with the intent, structure, and references associated with the development of this document, respectively.
- Section 2 presents a high-level overview of the DAS within the context of the DAS Subsystems, the external interfaces, and the processing that takes place within the DAS.
- Section 3 presents the functional and performance requirements of the DAS.
  - Functional requirements are organized in Section 3.1 based on the DAS SRD. Functional requirements presented are restricted to the lowest level of the function hierarchy and strictly address the question as to what the DAS will do. The functional requirements are qualitative.
  - The performance requirements are presented in Section 3.2. The same function hierarchy that is presented in Section 3.1 organizes the performance requirements. The requirements presented in this section are quantitative and strictly address the question how well certain aspects of the functional requirements will perform.
  - Section 3.3 contains the interface requirements for the DAS.
  - For clarity, subsystem requirements are shown in italics.
- Section 4 contains the reliability, maintainability, and the availability requirements for the DAS.
- Section 5 contains the physical and environmental requirements for the DAS equipment design and constitution.
- Section 6 contains the installation requirements for the DAS.
- Section 7 contains documentation.
- Section 8 contains training requirements for DAS.
- Section 9 contains maintenance requirements for DAS.
- Section 10 contains spare provisioning for the DAS.
- Section 11 contains security requirements for DAS.
- Section 12 contains human engineering and safety requirements for DAS.

Upon acceptance, the DAS will become an important addition to the existing White Sands Complex. The use of the existing TGBFS equipment, the addition of IBUGs and demodulators and system control functions will position the Space Network (SN) to better meet emerging customer needs through DAS.

1.3 DOCUMENTS

The following documents are part of this specification to the extent cited herein. The most recent version of these documents takes precedence. If no section number is shown, the whole document applies.

Document Number	Document Title
290-003	IP Operational Network (IOnet) Security Plan
430-14-01-001-0	Interface Control Document Between Landsat 7 and the Landsat 7 Ground Network (LGN
451-ICD-DAS/Customer	Interface Control Document between the Demand Access System and the Demand Access System Customers
451-ICD-DAS/SWSI	Interface Control Document between the Demand Access System and the Space Network Web Services Interface
451-ICD-DAS/WSC	Interface Control Document between the Demand Access System and the White Sands Complex
451-PN Codes-SNIP	Space Network Interoperable PN Code Libraries
500-tip-2111	Content Specification for Operation and Maintenance Manuals
530-WSC-0009	WSC Security Manual
530-WSC-0024	Information Technology Systems Security Plan (ITSSP) for the WSC
530-WSC-LOP-VII	The WSC Handbook Series, Volume Set Number VII, Engineering
542-SP-SWSI	Security Plan for SWSI
MIL-HDBK-217	Reliability Prediction of Electronic Equipment
MIL-HDBK-470a	Designing and Developing Maintainable Products and Systems
MIL-STD-1472C	Design Criteria Standard, Human Engineering
NPG 2810.1	NASA Procedures and Guidelines Security of Information Technology for Mission Information
STDN 270.5	GSFC Specification Electronic Equipment Racks

STDN 507	Networks Logistics Manual
STDN-SPEC-3	Specification Programming and Handling Semiconductor Devices
STDN-SPEC-4	GSFC General Requirements for STDN Electronic Equipment
STDN-SPEC-6	GSFC Specification Installation Requirements for STDN Equipment
STDN-SPEC-8	GSFC General Requirements for STDN Electronic Equipment Installation Materials
STDN-SPEC-10	Specification Station Handbook Documentation
STGT-HE-04-04	USS RF Equipment Group HWCI Specification (HWCI No. 4), Section 3.3.4
TLM-3-26	DSN Detailed Interface Design, DSN Telemetry Interface with MSFC for the Advanced X-ray Astrophysics Facility-Imaging (AXAF-I) Project
TLM-3-27	DSN External Interface Specification, DSN Telemetry Interface with the Advanced Composition Explorer (ACE)
TLM-3-29	DSN External Interface Specification, DSN Telemetry Standard Formatted Data Unit (SFDU) Interface
033-600010	DAS Reliability/Maintainability Availability Analysis Report

2 DAS REFERENCE ARCHITECTURE

2.1 DAS OPERATIONS SUMMARY

The DAS Operations are described in the DAS Operations Concept Document.

2.2 DAS REFERENCE ARCHITECTURE

Figure 2-1 provides an overview of the DAS Reference Architecture along with key external interfaces. The external interfaces support customer service requests and status through SWSI, the transport of telemetry data to customers over the NISN IOnets, and the receipt of EMC signals from WSC systems. The reference architecture is subject to change based on factors that may arise during development. The contractor's implementation of the reference architecture consists of eleven critical items or subsystem components. These include:

- Element Multiplexer/Correlator (EMC) Interface Subsystem: An optical switch in the EMC Interface subsystem provides the interface between WSGT/STGT EMCs and the Independent Beamformer Unit Group (IBUG) subsystem. The EMC Interface subsystem includes the Optical Switch, a Common Data Broadcast (CDB) Switch, and ancillary Ethernet cable connections. A single EMC can communicate with up to 10 IBUs. The IBUG Controller (ICON) controls the Optical Switch and the Optical Switch controls the CDB.
- IBUG Subsystem: An individual Beamforming Unit (IBU) in the IBUG subsystem accepts Multiple Access (MA) elements from the NASA Tracking and Data Relay Satellite (TDRS) Element Multiplexer/Correlator (EMC) and forms beams to the location commanded by the IBUG Controller (ICON).
- IF Switch Subsystem: Provides the Intermediate Frequency (IF) interfaces between Demodulator Units (DMUs) and IBUs.
- Receiver/Demodulation Group (DMG) Subsystem: An individual Demodulator Unit (DMU) in the DMG subsystem receives IF signals from IF Switch, demodulates the signals, and outputs baseband data to the Archive/Server subsystem via an Ethernet switch.
- Archive/Server Subsystem: Archives, formats, and routes baseband data over the NISN closed IOnet to DAS Customers. The Archive/Server subsystem consists of a network terminal, a router to interface with the GDIS network, and an Ethernet hub to interface with the NISN closed IOnet and with local user interfaces
- DASCON Subsystem: Provides overall system control with interfaces to ICON, the Demodulator Controller (DCON) and the NISN closed IOnet for connectivity to DAS Customers through the Space Network Web-based Services Interface (SWSI) system. The software is hosted on the DAS Local Control Monitor (LCM). DASCON
- ICON Subsystem: Controls the EMC Interface and IBUG/IBUs and manages the interfaces between DASCON, EMC Interface, and Beamformers. The control software is hosted on a workstation terminal.
- DCON Subsystem: Controls the IF Switch and demodulators, and manages the interfaces between the IF Switch and Demodulators. The control software is hosted on a workstation terminal.

- Timing and Frequency Subsystem: Provides system timing to the Archive/Server, DCON, ICON, and DASCON and accurate frequency information to the DMG.
- Power and Mechanical Subsystem: Provides electrical power to DAS subsystems and the physical infrastructure to contain the DAS hardware and software equipment components.

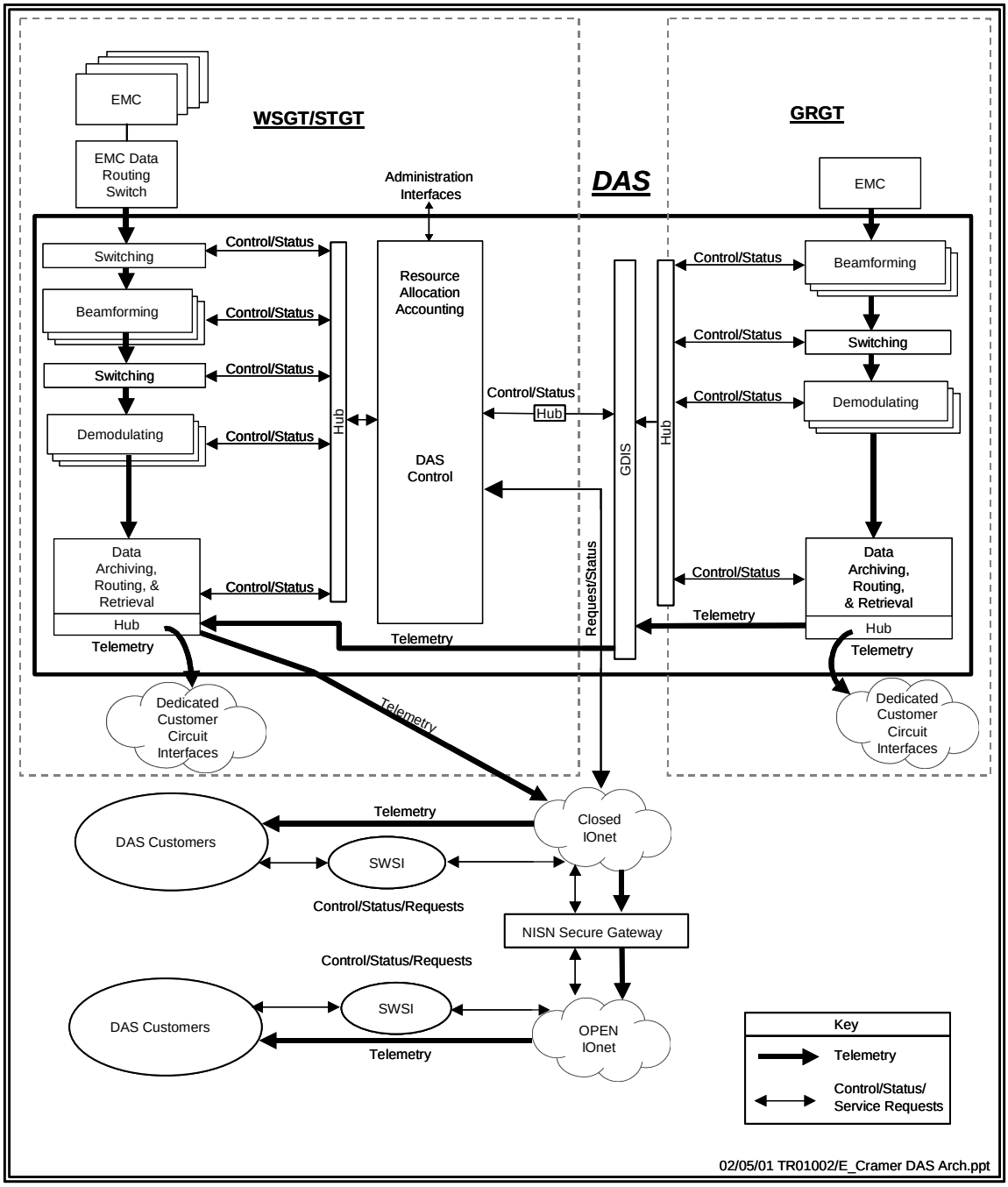

Figure 2-1: DAS Reference Architecture

3 SYSTEM REQUIREMENTS

3.1 FUNCTIONAL REQUIREMENTS

The purpose of the DAS is to allow a DAS Customer to request resource allocations that will result in the establishment of MA return data through the TDRSS from the Customer's emitter. DAS Customers will be capable of requesting resource allocation planning information from the DAS for use in making resource allocation request decisions. DAS Customer resource allocation requests will result in the automatic management of beamforming, demodulation, and return data distribution capabilities on the part of the DAS. The top-level system functions for the DAS are to:

- Provide for DAS Customers to request MA return resource allocations via an automated interface,
- Provide automated management capability to allocate MA return resources,
- Provide a beamforming capability,
- Provide a signal demodulation capability,
- Provide a data archival, retrieval, and distribution capability, and
- Support a WSC System Interface.

3.1.1 Customer Interactions Management

The purpose of this function is to provide DAS Customers with automated interaction capabilities that will authorize them to provide resource allocation requests to the DAS and to receive resource allocation reports from the DAS.

Requirements:

3.1.1.a The DAS shall process DAS Customer system access identification information as part of DAS logon procedures.

3.1.1.a-01 The SWSI System shall process DAS Customer system access identification information as provided as part of DAS logon procedures.

3.1.1.1 Customer Resource Configuration Management

The purpose of this function is to provide the DAS Customer with the capability of entering, storing, updating, and retrieving constant parameters that are included routinely in requests for resource allocations. The capability to automatically retrieve and attach this information to a resource allocation request will also be provided by this function.

Requirements:

3.1.1.1.a The DAS shall accept DAS Customer set(s) of resource configuration parameters.

3.1.1.1.a-01 The DASCON Subsystem shall accept resource configuration parameters as part of a DAS Customer resource allocation request, primarily through SWSI and secondarily through the DASCON Graphical User Interface (GUI).

3.1.1.1.b The DAS shall accept updates to existing sets of DAS Customer configuration parameters.

3.1.1.1.b-01 The DASCON Subsystem shall accept updates to existing DAS Customer supplied configuration parameters primarily through SWSI and as backup through the DASCON GUI.

3.1.1.1.c The DAS shall report to DAS Customers the contents of the configuration parameters currently retained.

3.1.1.1.c-01 The DASCON Subsystem shall report to a DAS Customer via SWSI the contents of the configuration parameters currently retained.

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3.1.2 Resource Management

The purpose of this function is to provide automatic management of MA return resource allocations based on DAS Customer requests for planning information and resources. In order to support the automated management of resources, this function determines resource availability times, manages DAS Customer and TDRS vector data, determines Customer emitter/TDRS visibility opportunities, assesses resource status of allocated resources, and reports the status to the DAS Customer and the DAS Local Control and Monitor.

The two types of DAS Customers that will be accommodated are:

Dedicated Customers – Customers guaranteed requested support from the shared set of DAS resources, and

Non-Dedicated Customers – Customers receiving first come, first serve support from the remaining set of shared resources after allocations have been made to support Dedicated Customers.

3.1.2.1 Resource Status Assessment

The purpose of this function is to automatically assess, log and report resource allocation status for a specific DAS Customer. The status report will be summarized to provide status as it applies to a specific resource allocation.

Requirements:

3.1.2.1.a The DAS shall collect and log status on each DAS Customer's allocated resources.

3.1.2.1.a-01 The DASCON Subsystem shall collect and log status on each DAS Customer's allocated resources.

3.1.2.1.b The DAS shall provide periodic, summarized resource allocation status reports to each DAS Customer, upon request.

3.1.2.1.b-01 The DASCON Subsystem shall provide periodic, summarized resource allocation status reports to each DAS Customer through the SWSI, upon request.

3.1.2.1.c The DAS shall provide periodic, unsolicited summarized resource allocation status reports to the DAS LCM.

3.1.2.1.c-01 The DASCON Subsystem shall provide periodic, unsolicited summarized resource allocation status reports to the DASCON GUI.

3.1.2.2 Resource Availability Assessment

The purpose of this function is to provide resource availability assessments in response to resource allocation planning requests and resource allocation requests made by DAS Customers. The assessments are based on the combined automated emitter visibility and DAS assets availability analysis results.

Requirements

3.1.2.2.a The DAS shall accept DAS Customer requests for resource allocation planning information.

3.1.2.2.a-01 The DASCON Subsystem shall accept DAS Customer requests through the SWSI for resource allocation planning information.

3.1.2.2.b The DAS shall provide resource allocation availability reports to a DAS Customer for planning such that specific resource allocation information of other Customers is not compromised.

3.1.2.2.b-01 For planning the DASCON Subsystem shall provide resource allocation availability reports to a DAS Customer via SWSI.

3.1.2.2.b-02 SWSI shall ensure that specific resource allocation information of other Customers is not compromised.

3.1.2.2.c The DAS shall provide resource availability data to the DAS LCM.

3.1.2.2.c-01 The DASCON Subsystem shall provide resource availability data to the DASCON GUI.

3.1.2.2.1 Visibility Time Windows

The purpose of this function is to determine the times when the Earth does not occlude the view of a TDRS (as seen from a DAS Customer emitter). The time series associated with these non-occultation

opportunities will be used to determine the time windows marking intervals of emitter/TDRS(s) line-of-sight visibility.

Requirements:

3.1.2.2.1.a The DAS shall provide DAS Customers with the option of specifying which TDRS(s) is (are) to be used in resource allocation service request.

3.1.2.2.1.a-01 Through the SWSI, the DASCON Subsystem shall allow DAS Customers the option of specifying which TDRS(s) is (are) to be used in the resource allocation requests.

3.1.2.2.1.b The DAS shall verify the validity of the DAS Customer's requests for TDRS assignments based upon visibility.

3.1.2.2.1.b-01 The DASCON Subsystem shall verify the validity of the DAS Customer's requests for TDRS(s) assignments based on visibility.

3.1.2.2.1.c The DAS shall use ephemeris data to automatically determine the visibility status of a TDRS.

3.1.2.2.1.c-01 The DASCON Subsystem shall use ephemeris data to automatically construct time windows that establish the time intervals when the Earth does not block the line-of-sight visibility between TDRS(s) and a DAS Customer platform.

3.1.2.2.1.d The DAS shall automatically construct the time windows within a DAS Customer specified time interval in order to identify when a TDRS is visible to a DAS Customer's emitter.

3.1.2.2.1.d-01 The DASCON Subsystem shall automatically construct the time windows within a DAS Customer specified time interval in order to identify when a single or multiple TDRS(s) is (are) visible to a DAS Customer's emitter.

3.1.2.2.2 Resource Allocation Options Determination

The purpose of this function is to automatically identify and determine the DAS resources that are available for allocation at any given time. The function will determine the time windows when the resources are available for assignment and the resources available for allocation based on combined line-of-site and resource availability temporal constraints

Requirements

3.1.2.2.2.a The DAS shall automatically assess resource allocation data to determine the allocation status of all DAS resource assets.

3.1.2.2.2.a-01 The DASCON Subsystem shall automatically assess resource allocation data to determine the allocation status of all DAS resource assets.

3.1.2.2.2.b The DAS shall automatically identify which DAS resource assets are available for allocation at any given time.

3.1.2.2.2.b-01 *The DASCON Subsystem shall automatically identify which DAS resource assets are available for allocation at any given time.*

3.1.2.2.2.c The DAS shall automatically construct the time windows within a DAS Customer specified time interval that identifies when DAS resource assets are available for allocation.

3.1.2.2.2.c-01 *The DASCON Subsystem shall automatically construct the time windows within a DAS Customer specified time interval that identifies when DAS resource assets are available for allocation.*

3.1.2.2.2.d All DAS resources shall be shared to fulfill allocation requests for dedicated and non-dedicated Customers.

3.1.2.2.2.d-01 *The DASCON Subsystem shall allow for the sharing of available dedicated and non-dedicated DAS Customer resources in order to fulfill Customer allocation requests.*

3.1.2.2.2.e The DAS shall automatically assess the availability of resources for non-dedicated Customers use based upon the resources that are available after fulfilling dedicated Customer requests.

3.1.2.2.2.e-01 *The DASCON Subsystem shall automatically assess the availability of resources for non-dedicated Customers use based upon the resources that are available after fulfilling dedicated Customer requests.*

3.1.2.2.2.f The DAS shall combine emitter visibility and resource assets availability information to determine allocations that meet a DAS Customer request.

3.1.2.2.2.f-01 *The DASCON Subsystem shall combine emitter visibility and resource availability information to determine allocation times that will meet a DAS Customer's planning request.*

3.1.2.2.2.g The DAS shall provide a report to the DAS Customer, which summarizes the times when planning request constraints can be realized.

3.1.2.2.2.g-01 *The DASCON Subsystem shall provide a report to the DAS Customer via SWSI, which summarizes the times when planning request constraints can be realized.*

3.1.2.3 DAS Resource Allocation

The purpose of this function is to assign DAS resource allocations in response to requests made by DAS Customers. The allocations are based on the combined TDRS to Customer visibility and resource availability analysis results.

3.1.2.3.1 Resource Assignment

The purpose of this function is to automatically assign DAS resources from the beamforming, demodulation, and data distribution assets based upon Customer requests.

Requirements

3.1.2.3.1.a The DAS shall accept DAS Customer requests for resource allocations.

3.1.2.3.1.a-01 The DASCON Subsystem shall accept DAS Customer requests for resource allocations primarily through SWSI and as backup through the DASCON GUI.

3.1.2.3.1.b The DAS shall automatically allocate resources for the DAS Customers who request resources.

3.1.2.3.1.b-01 The DASCON Subsystem shall automatically allocate resources for the DAS Customers who request resources.

3.1.2.3.1.c The DAS shall ensure that the allocation of resources for Non-Dedicated Customers is never in conflict with the allocation of resources for Dedicated Customers.

3.1.2.3.1.c-01 The DASCON Subsystem shall ensure that the allocation of resources for Non-Dedicated Customers is never in conflict with the allocation of resources for Dedicated Customers.

3.1.2.3.1.d The DAS shall automatically assign resources from the shared pool of DAS resources to non-dedicated Customers when the resources are not required to fulfill dedicated Customer requests.

3.1.2.3.1.d-01 The DASCON Subsystem shall automatically assign resources from the shared pool of DAS resources to non-dedicated Customers when the resources are not required to fulfill dedicated Customer requests.

3.1.2.3.1.e The DAS shall automatically assign TDRS satellite(s) to a resource allocation request if no specific TDRS satellite(s) is (are) designated in the DAS Customer's request.

3.1.2.3.1.e-01 The DASCON Subsystem shall automatically assign TDRS satellite(s) to a resource allocation request if no specific TDRS satellite(s) is (are) designated in the DAS Customer's request.

3.1.2.3.1.f The DAS shall log the resource allocation time intervals for each DAS asset.

3.1.2.3.1.f-01 The DASCON Subsystem shall log the resource allocation time intervals for each DAS asset.

3.1.2.3.1.g The DAS shall automatically make TDRS to TDRS transition assessments that will occur during a service as needed to support the assigning of DAS assets to satisfy each DAS Customer resource allocation request.

3.1.2.3.1.g-01 The DASCON Subsystem shall automatically make TDRS to TDRS transition assessments that will occur during a service as needed to support the assigning of DAS assets to satisfy each DAS Customer resource allocation request.

3.1.2.3.1.h The DAS shall provide status to the DAS Customer that reports the action taken as a result of the processing of resource allocation request.

3.1.2.3.1.h-01 *The DASCON Subsystem shall provide status to the DAS Customer via SWSI that reports the action taken as a result of the processing of resource allocation request.*

3.1.2.3.1.i The DAS shall log resource assignment statistics as service accounting data.

3.1.2.3.1.i-01 *The DASCON Subsystem shall log resource assignment statistics as service accounting data.*

3.1.2.3.1.j The DAS shall support assignment of demodulated signals from multiple emitters in the same beam.

3.1.2.3.1.j-01 *The DASCON Subsystem shall support assignment of demodulated signals from multiple emitters in the same beam.*

3.1.2.3.1.k The DAS shall provide resource assignment data to the DAS LCM.

3.1.2.3.1.k-01 *The DASCON Subsystem shall provide resource assignment data to the DASCON GUI.*

3.1.2.3.1.l The DAS shall notify the DAS Customer of any change to a resource allocation request that prevents the DAS Customer request from being supported.

3.1.2.3.1.l-01 *The DASCON Subsystem shall notify a DAS Customer via SWSI with an existing resource allocation of any change that prevents the allocation from being implemented.*

3.1.2.3.1.m The DAS shall be capable of removing from the DAS shared resources any resources that are unavailable due to failure or maintenance action.

3.1.2.3.1.m-01 *The ICON Subsystem shall be capable of removing from the DAS shared resources any resources under its control that are unavailable due to failure or maintenance action.*
3.1.2.3.1.m-02 *The DCON Subsystem shall be capable of removing from the DAS shared resources any resources under its control that are unavailable due to failure or maintenance action.*

3.1.2.3.1.n The DAS shall reject resource allocation requests that cannot be implemented due to time or resource constraints.

3.1.2.3.1.n-01 *The DASCON Subsystem shall reject resource allocation requests that cannot be implemented due to time or resource constraints.*

3.1.2.3.2 Resource Assignment Modification

The purpose of this function is to allow a DAS Customer to modify (reconfigure or delete) a pending or an on-going request.

Requirements

3.1.2.3.2.a The DAS shall ensure a DAS Customer is restricted from modifying requests submitted by other DAS Customers.

3.1.2.3.2.a-01 *The SWSI System shall ensure a DAS Customer is restricted from modifying requests submitted by other DAS Customers.*

3.1.2.3.2.b The DAS shall allow a DAS Customer to modify an accepted request that is pending implementation.

3.1.2.3.2.b-01 Subject to resource constraints and time window availability, the DASCON Subsystem shall allow a DAS Customer to modify, through SWSI or as backup through the DASCON GUI, an accepted request that is pending implementation.

3.1.2.3.2.c The DAS shall allow a DAS Customer to modify an on-going request.

3.1.2.3.2.c-01 Subject to resource constraints and time window availability, the DASCON Subsystem shall allow a DAS Customer to modify an on-going request through SWSI or as backup through the DASCON GUI.

3.1.2.3.2.d The DAS shall provide status to the DAS Customer that reports the action taken as the result of the processing of modification requests.

3.1.2.3.2.d-01 The DASCON Subsystem shall provide status via SWSI to the DAS Customer that reports the action taken as the result of the processing of modification requests.

3.1.2.3.2.e The DAS shall return DAS allocated assets to the pool of unallocated resources if no longer needed to support Customer resource allocation assignments.

3.1.2.3.2.e-01 The ICON Subsystem shall return DAS allocated assets to the pool of unallocated resources if no longer needed to support Customer resource allocation assignments.
3.1.2.3.2.e-02 The DCON Subsystem shall return DAS allocated assets to the pool of unallocated resources if no longer needed to support Customer resource allocation assignments.

3.1.2.3.2.f The DAS shall log the modification of resource assignments.

3.1.2.3.2.f-01 The DASCON Subsystem shall log the modification of resource assignments.

3.1.2.4 Vector Data Management

The purpose of this function is to automatically manage TDRS and DAS Customer vector data. Ephemeris generation, storage, and removal using TDRS and DAS Customer state vectors are the major capabilities associated with this function.

3.1.2.4.1 TDRS Ephemerides Generation

The purpose of this function is to automatically generate TDRS ephemeris from WSC System supplied TDRS state vectors.

Requirements

3.1.2.4.1.a The DAS shall automatically accept TDRS vector data in accordance with the ICD between the DAS and the WSC, 451-ICD-DAS/WSC.

3.1.2.4.1.a-01 The ECON Subsystem shall automatically accept TDRS vector data in accordance with the ICD between the DAS and the WSC, 451-ICD-DAS/WSC.

3.1.2.4.1.b The DAS shall support manual entry of TDRS vector data via the DAS LCM.

3.1.2.4.1.b-01 The ECON Subsystem shall support manual entry of TDRS vector data via the ECON GUI.

3.1.2.4.1.c The DAS shall notify Local Control and Monitor when a TDRS state vector update is overdue.

3.1.2.4.1.c-01 The DASCON Subsystem shall notify the Local Control and Monitor when a TDRS state vector update is overdue.

3.1.2.4.1.d The DAS shall propagate the last state vector in the existing TDRS ephemeris if a new state vector update is not available.

3.1.2.4.1.d-01 The DASCON Subsystem shall propagate the last state vector in the existing TDRS ephemeris if a new state vector update is not available.
3.1.2.4.1.d-02 The ICON Subsystem shall propagate the last state vector in the existing TDRS ephemeris if a new state vector update is not available.
3.1.2.4.1.d-03 The DCON Subsystem shall propagate the last state vector in the existing TDRS ephemeris if a new state vector update is not available.

3.1.2.4.1.e The DAS shall automatically log TDRS ephemeris.

3.1.2.4.1.e-01 The DASCON Subsystem shall automatically log TDRS ephemeris.

3.1.2.4.2 Customer Ephemeris Generation

The purpose of this function is to automatically generate DAS Customer emitter ephemeris from DAS Customer supplied emitter Type 1 (on-orbit) and Type 8 (stationary) state vectors.

Requirements

3.1.2.4.2.a The DAS shall automatically accept DAS Customer emitter vector data.

3.1.2.4.2.a-01 The DASCON Subsystem shall automatically accept DAS Customer emitter vector data provided via SWSI.

3.1.2.4.2.b The DAS shall support manual entry of DAS Customer emitter vector data via the DAS LCM.

3.1.2.4.2.b-01 The DASCON Subsystem shall support the manual entry of a DAS Customer emitter state vector through via the DASCON GUI.

3.1.2.4.2.c The DAS shall automatically access an ephemeris for each DAS Customer emitter during resource allocation assessments.

3.1.2.4.2.c-01 The DASCON Subsystem shall automatically make use of any existing state vector and previously generated ephemeris data for each DAS Customer emitter during resource allocation assessments.

3.1.2.4.2.d The DAS shall automatically log an orbiting DAS Customer emitter ephemeris.

3.1.2.4.2.d-01 The DASCON Subsystem shall automatically log an orbiting DAS Customer emitter ephemeris.

3.1.2.4.2.e The DAS shall notify a DAS Customer and the DAS LCM when a DAS Customer state vector update is overdue.

3.1.2.4.2.e-01 The DASCON Subsystem shall notify a DAS Customer via SWSI and the DASCON GUI when a DAS Customer state vector is overdue.

3.1.2.4.2.f The DAS shall propagate the last state vector in the existing DAS Customer ephemeris if a new state vector update is not available.

3.1.2.4.2.f-01 The DASCON Subsystem shall propagate the last state vector in the existing DAS Customer ephemeris for visibility assessments if a new state vector update is not available.
3.1.2.4.2.f-02 The ICON Subsystem shall propagate the last state vector in the existing DAS Customer ephemeris for direction cosine processing if a new state vector update is not available.
3.1.2.4.2.f-03 The DCON Subsystem shall propagate the last state vector in the existing DAS Customer ephemeris for signal acquisition and tracking if a new state vector update is not available.

3.1.2.4.2.g The DAS shall retain Type 8 vector data.

3.1.2.4.2.g-01 The DASCON Subsystem shall retain Type 8 vector data.

3.1.2.4.2.h The DAS shall generate an alert to the DAS LCM when TDRS or DAS Customer state vector updates are overdue.

3.1.2.4.2.h-01 The DASCON Subsystem shall send alert information to the DASCON GUI when a TDRS or DAS Customer state vector update is overdue.

3.1.2.4.2.h-02 The DASCON Subsystem shall generate an alert to the CTFS SSC when a TDRS or DAS Customer state vector update is overdue.

3.1.2.4.3 Outdated Ephemerides Processing

The purpose of this function is to automatically remove outdated TDRS and DAS Customer emitter ephemerides.

Requirements

3.1.2.4.3.a The DAS shall automatically identify outdated ephemerides.

3.1.2.4.3.a-01 The DASCON Subsystem shall automatically identify outdated ephemerides.
3.1.2.4.3.a-02 The ICON Subsystem shall automatically identify outdated ephemerides.
3.1.2.4.3.a-03 The DCON Subsystem shall automatically identify outdated ephemerides.

3.1.2.4.3.b The DAS shall automatically purge all outdated ephemerides.

3.1.2.4.3.b-01 The DASCON Subsystem shall automatically purge all outdated ephemerides.

3.1.2.4.3.b-02 The ICON Subsystem shall automatically purge all outdated ephemerides.
3.1.2.4.3.b-03 The DCON Subsystem shall automatically purge all outdated ephemerides.

3.1.3 MAR Beamforming

The purpose of this function is to automatically manage the MA beamformers. In addition, this function performs beamforming and reports status of the beamformers.

3.1.3.1 Beamforming

The purpose of this function is to weight and sum element signals to form a beam focused at the specified location based on service request.

To mitigate interference, the DAS will place nulls (or reduced gain) in the direction of interference signals, while still maintaining specified beamforming gain towards the desired Customer. In adaptive nulling the DAS will automatically detect interference and form appropriate nulls.

Requirements

3.1.3.1.a The DAS *beamformer* shall receive the output of the existing WSC System MA System Element Multiplexer Correlator (EMC) in accordance with the ICD between the DAS and the WSC, 451-ICD-DAS/WSC.

3.1.3.1.a-01 The EMC Interface Subsystem shall receive the output of the existing WSC System MA System Element Multiplexer Correlator (EMC) in accordance with the ICD between the DAS and the WSC, 451-ICD-DAS/WSC.

3.1.3.1.b The DAS shall support the TGBFS Pointing beamforming mode.

3.1.3.1.b-01 The Beamformer Subsystem shall support the TGBFS Pointing beamforming mode.
3.1.3.1.b-02 The ICON Subsystem shall support the TGBFS Pointing beamforming mode.

3.1.3.1.c The DAS shall support the TGBFS Adaptive beamforming mode.

3.1.3.1.c-01 The Beamformer Subsystem shall support the TGBFS Adaptive beamforming mode.
3.1.3.1.c-02 The ICON Subsystem shall support the TGBFS Adaptive beamforming mode.

3.1.3.1.d The DAS shall support the TGBFS Fixed Weight beamforming modes.

3.1.3.1.d-01 The Beamformer Subsystem shall support the TGBFS Fixed Weight beamforming modes.
3.1.3.1.d-02 The ICON Subsystem shall support the TGBFS Fixed Weight beamforming modes.

3.1.3.1.e The DAS interfaces from the EMC to the beamformer(s) shall support one-to-one and one-to-many connections.

3.1.3.1.e-01 The EMC Interface Subsystem interface with the EMC shall support a one-to-one and one-to-many connections between the EMC and the Beamformer Subsystem.
3.1.3.1.e-02 The Beamformer Subsystem interface from the EMC shall be one-to-one and one to many connections through the EMC Interface Subsystem.

3.1.3.1.f The DAS beamformer(s) shall switch between EMC output(s).

3.1.3.1.f-01 The EMC Interface Subsystem shall switch signal(s) from selected EMC(s) to selected IBUGs.

3.1.3.1.f-02 The ICON Subsystem shall command the EMC Interface Subsystem to switch between EMC output(s) and Beamformer Subsystem inputs.

3.1.3.1.g The DAS shall weight and sum signals from selected EMC(s).

3.1.3.1.g-01 The Beamformer Subsystem shall weight and sum signal(s) from selected EMC(s).

3.1.3.1.h The DAS shall output the weighted-sum signal(s).

3.1.3.1.h-01 The Beamformer Subsystem shall output the weighted-sum signal(s).

3.1.3.1.i The DAS shall switch out any of the element channels upon request.

3.1.3.1.i-01 The Beamformer Subsystem shall switch out any of the element channels upon request.

3.1.3.1.i-02 The Beamformer Subsystem shall execute configuration commands received from the ICON Subsystem.

3.1.3.1.i-03 The ICON Subsystem shall provide configuration commands to the Beamformer Subsystem in order to switch out any of the element channels upon request.

3.1.3.1.j The DAS shall automatically null interfering signals, when in adaptive nulling mode.

3.1.3.1.j-01 The Beamformer Subsystem shall automatically null interfering signals, when in the adaptive nulling mode.

3.1.4 Signal Demodulation

The purpose of this function is to receive the formed MAR beams and demodulate selected Customer data bearing signals within the formed MAR beams.

3.1.4.1 Demodulation Selection

The purpose of this function is to receive the formed MAR beams and make the necessary connections between formed MAR beams and demodulators.

Requirements

3.1.4.1.a The demodulator interfaces to the beamformer shall be one-to-one and one-to-many.

3.1.4.1.a-01 The IF Switch Subsystem shall switch any single IBU output port in the Beamformer Subsystem to one or multiple demodulator input port(s) in the Demodulator Subsystem.

3.1.4.1.a-02 The DCON Subsystem shall command the IF Switch Subsystem to switch any single IBU output port in the Beamformer Subsystem to one or multiple demodulator input port(s) in the Demodulator Subsystem.

3.1.4.2 Demodulation

The purpose of this function is to receive a formed beam and Customer return data from the Customer signal contained within the signal.

3.1.4.2.1 Return Data Retrieval

The purpose of this function is to recover Customer baseband data.

Requirements

3.1.4.2.1.a The DAS shall provide Doppler correction for Customer emitters.

3.1.4.2.1.a-01 The Demodulator Subsystem shall provide Doppler correction for Customer emitters.
3.1.4.2.1.a-02 The DCON Subsystem shall provide the data necessary for the Demodulator Subsystem to provide Doppler correction for Customer emitters.

3.1.4.2.1.b The DAS shall despread the received PN spread signal.

3.1.4.2.1.b-01 The Demodulator Subsystem shall despread the received PN spread signal.

3.1.4.2.1.c The DAS shall demodulate the carrier.

3.1.4.2.1.c-01 The Demodulator Subsystem shall demodulate the carrier.

3.1.4.2.1.d The DAS shall provide recovered carrier for Doppler measurement.

3.1.4.2.1.d-01 The Demodulator Subsystem shall provide recovered carrier frequency for oscillator frequency estimation

3.1.4.2.1.e The DAS shall recover symbol clock and detect the symbol.

3.1.4.2.1.e-01 The Demodulator Subsystem shall recover symbol clock and detect the symbol.

3.1.4.2.1.f The DAS shall perform convolutional decoding on each baseband symbol stream.

3.1.4.2.1.f-01 The Demodulator Subsystem shall perform convolutional decoding on each baseband symbol stream.

3.1.4.2.1.g Deleted.

3.1.4.2.1.h The DAS shall resolve data phase ambiguity.

3.1.4.2.1.h-01 The Demodulator Subsystem shall resolve data phase ambiguity.

3.1.4.2.1.i The DAS shall consider the Customer oscillator frequency uncertainty and signal dynamics when acquiring the Customer signal.

3.1.4.2.1.i-01 The Demodulator Subsystem shall consider the Customer oscillator frequency uncertainty and signal dynamics when acquiring the Customer signal.

3.1.4.2.1.j Deleted.

3.1.5 Return Data Distribution

The purpose of this function is to provide DAS Customers with MA return data distribution, archiving and retrieving capabilities.

3.1.5.1 Return Data Transmission

The purpose of this function is to provide the capability to route return data obtained in real-time or retrieved from the archive.

3.1.5.1.1 Return Data Formatting

Requirements

3.1.5.1.1.a Deleted.

3.1.5.1.1.b The DAS shall support Consultative Committee for Space Network Data Systems (CCSDS) formatted return data as implemented in the WSC Transmission Control Protocol (TCP)/Internet Protocol (IP) Data Interface Services Capability (WDISC).

3.1.5.1.1.b-01 The Archive/Server Subsystem shall support Consultative Committee for Space Network Data Systems (*CCSDS) formatted return data* as implemented in the WSC Transmission Control Protocol (TCP)/Internet Protocol (IP) Data Interface Services Capability (WDISC).

3.1.5.1.2 Return Data Routing

The purpose of this function is to determine real-time and archived data routing according to the destination(s) specified by DAS Customer requests for resource allocations.

Requirements

3.1.5.1.2.a The DAS shall route Customer data to specified destination(s) in accordance with the ICD between the DAS and DAS Customers, 451-ICD-DAS/Customers.

3.1.5.1.2.a-01 The Archive/Server Subsystem shall route Customer data to specified destination(s) in accordance with the ICD between the DAS and DAS Customers, 451-ICD-DAS/Customers.

3.1.5.1.2.b The DAS shall route real-time MA return telemetry data to DAS Customer specified destination(s) via the NASA Integrated Services Network (NISN) Closed Internet Protocol (IP) Operational Network (IOnet) or dedicated Customer circuits.

3.1.5.1.2.b-01 The Archive/Server Subsystem shall route real-time MA return telemetry data to DAS Customer specified destination(s) via the NASA Integrated Services Network (NISN) Closed IP Operational Network (IOnet) or dedicated Customer circuits.

3.1.5.1.2.c Deleted.

3.1.5.1.2.d The DAS shall route retrieved archived MA return telemetry data to DAS Customer specified destination(s) via the NISN Closed IOnet or dedicated Customer circuits.

3.1.5.1.2.d-01 The Archive/Server Subsystem shall route retrieved archived MA return telemetry data to DAS Customer specified destination(s) via the NISN Closed IOnet or dedicated Customer circuits.

3.1.5.1.2.d-02 In accordance with commands received through SWSI, the DASCON Subsystem shall command the Archive/Server Subsystem to route retrieved archived MA return telemetry data to DAS Customer specified destination(s) via the NISN Closed IOnet or dedicated Customer circuits.

3.1.5.1.2.e Deleted.

3.1.5.1.2.f Deleted.

3.1.5.1.2.g The DAS shall route Customer service performance data to the DAS Customer specified destination(s) in accordance with the ICD between the DAS and SWSI, 451-ICD-DAS/SWSI.

3.1.5.1.2.g-01 The Archive/Server Subsystem shall provide Customer service performance data to the DAS Customer specified destination(s) in accordance with the ICD between the DAS and SWSI, 451-ICD-DAS/SWSI.

3.1.5.1.3 Archived Return Data Retrieval

The purpose of this function is to retrieve the designated MA return data from archive at the times specified in DAS Customer requests for resource allocations.

Requirements

3.1.5.1.3.a The DAS shall retrieve archived return data based on DAS Customer request.

3.1.5.1.3.a-01 Based on DAS Customer request, the Archive/Server Subsystem shall retrieve archived return data in accordance with commands received from DASCON.

3.1.5.1.3.a-02 The DASCON Subsystem shall command the Archive/Server Subsystem to retrieve archived return data based on DAS Customer request.

3.1.5.1.3.b The DAS shall update the service accounting statistics with the return data retrieval statistics.

3.1.5.1.3.b-01 The DASCON Subsystem shall update the service accounting statistics with the return data retrieval statistics.

3.1.5.1.4 Return Data Transmission

The purpose of this function is to transmit MA telemetry data to DAS Customer destinations based on routing information.

Requirements

(Note: This is part of the required role for the NISN interface. We establish a connection to the NISN firewall. Customer destinations are added to the NISN gateway by hand when a user becomes a DAS customer. If this gateway connection is not supported, then a Customer specified network local interface is required.)

3.1.5.1.4.a The DAS shall establish connection(s) with destination(s) to send return data.

3.1.5.1.4.a-01 The Archive/Server Subsystem shall establish connection(s) to destination IP addresses to support the delivery of real-time and retrieved archived return data to DAS Customers.

3.1.5.1.4.a-02 The DASCON Subsystem shall command the Archive/Server Subsystem to establish connection(s) to destination IP addresses to support the delivery of real-time and retrieved archived return data to DAS Customers.

3.1.5.1.4.b The DAS shall automatically re-establish a connection when the connection to a destination is severed.

3.1.5.1.4.b-01 The Archive/Server Subsystem shall automatically re-establish a connection when the connection to a destination is severed.

3.1.5.1.4.b-02 The DASCON Subsystem shall command the Archive/Server Subsystem to automatically re-establish a connection when the connection to a destination is severed.

3.1.5.1.4.c The DAS shall log the transmit status in the DAS Customer service accounting data.

3.1.5.1.4.c-01 The DASCON Subsystem shall log the transmit status in the DAS Customer service accounting data.

3.1.5.1.4.c-02 The Archive/Server Subsystem shall send the transmit status in the DAS Customer service accounting data to the DASCON Subsystem, upon command.

3.1.5.1.4.d The DAS shall route real-time and archived return data to a DAS Customer simultaneously, if requested.

3.1.5.1.4.d-01 The Archive/Server Subsystem shall route real-time and archived return data to a DAS Customer simultaneously, if requested.

3.1.5.1.4.e The DAS shall manage the utilization of the GRGT-to-WSGT allocated aggregate bandwidth to support real-time and archived retrieval supports.

3.1.5.1.4.e-01 The Archive/Server Subsystem shall manage the utilization of the GRGT-to-WSGT allocated aggregate bandwidth to support real-time and archived retrieval supports.

3.1.5.1.4.f The DAS shall manage the utilization of the WSC allocated aggregate bandwidth to support real-time and archived retrieval supports.

3.1.5.1.4.f-01 The DASCON Subsystem shall manage the utilization of the WSC allocated aggregate bandwidth to support real-time and archived retrieval supports.

3.1.5.1.4.g The GRGT-to-WSC and WSC DAS allocated aggregate bandwidths shall be values that can be input and modified from the DAS LCM.

3.1.5.1.4.g-01 The DASCON Subsystem shall accept GRGT-to-WSC and WSC DAS allocated aggregate bandwidth values input from the DAS GUI.
3.1.5.1.4.g-02 The DASCON Subsystem shall allow GRGT-to-WSC and WSC DAS allocated aggregate bandwidth values to be modified from the DAS GUI.

3.1.5.2 Return Data Archiving Management

The purpose of this function is to automatically manage the storage and removal of archived return data.

3.1.5.2.1 Return Data Storage

The purpose of this function is to archive the return data and to log the archiving event if designated to do so in the DAS Customer request specifications and to log the archiving event in the DAS Customer service accounting data.

Requirements

3.1.5.2.1.a The DAS shall archive real-time return data.

3.1.5.2.1.a-01 The DASCON Subsystem shall command the Archive/Server Subsystem to archive real-time return data.
3.1.5.2.1.a-02 The Archive/Server Subsystem shall archive real-time return data.

3.1.5.2.1.b The DAS shall maintain DAS Customer data for the retention duration requested by the DAS Customer as automated archive management parameters.

3.1.5.2.1.b-01 The Archive/Server Subsystem shall maintain DAS Customer data for the retention duration requested by the DAS Customer as automated archive management parameters.

3.1.5.2.1.c The DAS shall update the resource usage statistics with the resource information, resource requested and time periods for archiving.

3.1.5.2.1.c-01 The DASCON Subsystem shall update the resource usage statistics with the resource information, resource requested and time periods for archiving.
3.1.5.2.1.c-02 The Archive/Server Subsystem shall generate resource usage statistics reports.
3.1.5.2.1.c-03 The Archive/Server Subsystem shall send archive storage usage statistics reports to the DASCON Subsystem.

3.1.5.2.1.d The DAS shall log the storage statistics in the DAS Customer service accounting data.

3.1.5.2.1.d-01 The DASCON Subsystem shall log storage statistics in the DAS Customer accounting data.
3.1.5.2.1.d-02 The Archive/Server Subsystem shall generate DAS Customer service accounting data reports.
3.1.5.2.1.d-03 The Archive/Server Subsystem shall send service accounting data reports to the DASCON Subsystem.

3.1.5.2.2 Outdated Archived Data Purging

The purpose of this function is to automatically remove data that has exceeded its specified lifetime limit from the return data archive.

Requirements

3.1.5.2.2.a The DAS shall have a defined maximum allowed storage duration.

3.1.5.2.2.a-01 The Archive/Server Subsystem shall monitor the return data archive in order to determine the amount of free data storage capacity.

3.1.5.2.2.a-02 The Archive/Server Subsystem shall have a defined maximum allowed storage duration for archived return data of seven calendar days as a default and up to 30 calendar days if specified by the customer.

3.1.5.2.2.b The DAS shall automatically remove archived data that has exceeded the limit based on the Customer data distribution specifications.

3.1.5.2.2.b-01 The DASCON Subsystem shall automatically determine when archived data in the Archive/Server Subsystem has reached DAS Customer defined storage time limits.

3.1.5.2.2.b-02 The DASCON Subsystem shall provide DAS Customer supplied archived data purging specifications to the Archive/Server Subsystem.

3.1.5.2.2.b-03 The Archive/Server Subsystem shall automatically remove archived data that has exceeded a storage time limit specified by the DASCON Subsystem.

3.1.5.2.2.c The DAS shall automatically remove archived data that has exceeded a defined maximum storage capacity limit.

3.1.5.2.2.c-01 The DASCON Subsystem shall automatically determine when archived data in the Archive/Server Subsystem has reached preset storage limit, nominally 95% of its maximum storage capacity.

3.1.5.2.2.c-02 The Archive/Server Subsystem shall automatically remove archived data that has exceeded the pre-set archive storage limits, as specified by DASCON.

3.1.5.2.2.c-03 The Archive/Server Subsystem shall automatically remove archived data by removing the oldest archive data first.

3.1.5.2.2.c-04 The Archive/Server Subsystem shall automatically begin to purge the oldest archived data when the archive has reached 95% of its maximum capacity.

3.1.5.2.2.c-05 The Archive/Server Subsystem shall automatically purge archived data such that at least 50% of the maximum capacity is preserved after the deletion operation.

3.1.5.2.2.d The DAS shall log the purge events in the DAS Customer service accounting data.

3.1.5.2.2.d-01 The Archive/Server Subsystem shall report the purge events in the DAS Customer service accounting data to the DASCON Subsystem.

3.1.5.2.2.d-02 The DASCON Subsystem shall log the purge events in the DAS Customer service accounting data from the reports received by the Archive/Server Subsystem.

3.1.6 Local Control and Monitor (LCM)

The purpose of this function is to provide a local control and monitor interface to the DAS.

Requirements

3.1.6.a The DAS LCM shall provide an operational interface to monitor, coordinate, control and report the performance of all DAS system components.

3.1.6.a-01 The ICON Subsystem shall provide an operational interface to monitor, coordinate, control and report the performance of ICON Subsystem and its controlled component subsystems through the ICON GUI.

3.1.6.a-02 The DASCON Subsystem shall provide a control interface for the DASCON Subsystem via the DASCON GUI.

3.1.6.a-03 The DCON Subsystem shall provide an operational interface to monitor, coordinate, control and report the performance of DCON and its Subsystem controlled components through the DCON GUI.

3.1.6.b The DAS shall accept system control commands from the DAS LCM.

3.1.6.b-01 The DASCON Subsystem shall accept system control commands from the DASCON GUI.

3.1.6.b-02 The ICON Subsystem shall accept system control commands from the ICON GUI.

3.1.6.b-03 The DCON Subsystem shall accept system control commands from the DCON GUI.

3.1.6.c The DAS shall provide system control reports to the DAS LCM.

3.1.6.c-01 The DASCON Subsystem shall provide system control reports to the DASCON GUI.

3.1.6.d The DAS shall accept system status requests from the DAS LCM.

3.1.6.d-01 The DASCON Subsystem shall accept system status requests from the DASCON GUI.

3.1.6.e The DAS shall report system status to the DAS LCM.

3.1.6.e-01 The DASCON Subsystem shall report system status to the DASCON GUI.

3.1.6.f The DAS shall accept DAS Customer authentication and authorization data from the DAS LCM.

3.1.6.f-01 The SWSI System shall accept DAS Customer authentication and authorization data.

3.1.6.g The DAS shall report the current DAS Customer authentication and authorization data to the DAS LCM.

3.1.6.g-01 The SWSI System shall manage the current DAS Customer authentication and authorization data.

3.1.6.h The DAS shall accept requests for service accounting reports from the DAS LCM.

3.1.6.h-01 *The DASCON Subsystem shall accept requests for service accounting reports from the DASCON GUI.*

3.1.6.i The DAS shall support enabling and disabling adaptive nulling from the LCM.

3.1.6.i-01 *The ICON Subsystem shall support enabling and disabling TGBFS adaptive nulling from the GUI.*

3.1.6.i-02 *The DASCON Subsystem shall support the ICON subsystem in enabling and disabling TGBFS adaptive nulling, when these commands are passed to DASCON through customer requests.*

3.1.7 Status

3.1.7.1 System Status

The purpose of this function is to collect and report system wide status of the hardware and software components that constitute the DAS.

Requirements

3.1.7.1.a The DAS shall provide status of all components that constitute the DAS to the LCM.

3.1.7.1.a-01 *The DASCON shall provide status of all components that constitute the DAS to the DASCON GUI, based on status reports provided by ICON, DCON and the Archive/Server Subsystem controllers.*

3.1.7.1.a-02 *The DCON Subsystem shall provide status of all components under its control to the DCON GUI and the DASCON.*

3.1.7.1.a-03 *The ICON Subsystem shall provide status of all components under its control to the ICON GUI and the DASCON.*

3.1.7.1.a-04 *The Archive/Server Subsystem shall provide status of all Archive/Server Subsystem components to the DASCON GUI.*

3.1.7.1.b The DAS shall perform periodic and continuous statusing of all components that constitute DAS.

3.1.7.1.b-01 *The DASCON Subsystem shall perform periodic and continuous statusing of all components that constitute DAS.*

3.1.7.1.b-02 *The DCON Subsystem shall perform periodic and continuous statusing of all components under DCON control.*

3.1.7.1.b-03 *The ICON Subsystem shall perform periodic and continuous statusing of all components under ICON control.*

3.1.7.1.c The DAS shall log all status of all components that constitute DAS.

3.1.7.1.c-01 *The DASCON Subsystem shall log all status of all components that constitute DAS.*

3.1.7.1.c-02 *The DCON Subsystem shall log all status of all components under DCON control.*

3.1.7.1.c-03 *The ICON Subsystem shall log all status of all components under ICON control.*

3.1.7.1.d The DAS shall support delogging of all collected status.

3.1.7.1.d-01 *The DASCON Subsystem shall support de-logging of all collected status.*
3.1.7.1.d-02 *The DCON Subsystem shall support de-logging of all collected status.*
3.1.7.1.d-03 *The ICON Subsystem shall support de-logging of all collected status.*

3.1.7.1.e The DAS shall support printing of delogged status.

3.1.7.1.e-01 *The DASCON Subsystem shall support printing of de-logged DAS status.*
3.1.7.1.e-02 *The ICON Subsystem shall support printing of de-logged ICON status.*
3.1.7.1.e-03 *The DCON Subsystem shall support printing of de-logged DCON status.*

3.1.7.1.f The DAS shall indicate via an alert to the WSC TOCC when abnormalities are detected in DAS operations and resources.

3.1.7.1.f-01 *The DASCON Subsystem shall indicate via an alert to the CTFS SSC when abnormalities are detected in DAS operations and resources.*

3.1.7.1.g The DAS shall provide status indicators on the equipment front panels of all components that constitute DAS.

3.1.7.1.g-01 *The EMC interface subsystem shall provide status indicators on the front panels of all components that constitute the EMC Interface Subsystem.*
3.1.7.1.g-02 *The Beamformer Subsystem shall provide status indicators on the front panels of all components that constitute the Beamformer Subsystem.*
3.1.7.1.g-03 *The ICON Subsystem shall provide status indicators on the equipment front panels of all components that constitute the ICON Subsystem.*
3.1.7.1.g-04 *The IF Switch Subsystem shall provide status indicators on the front panels of all components that constitute the IF Switch Subsystem.*
3.1.7.1.g-05 *The DASCON Subsystem shall provide status indicators on the equipment front panels of all the equipment that constitute the DASCON Subsystem.*
3.1.7.1.g-06 *The DCON Subsystem shall provide status indicators on the equipment front panels of all components that constitute part of DCON Subsystem.*
3.1.7.1.g-07 *The Demodulator Subsystem shall provide status indicators on the front panels of all components that constitute the Demodulator Subsystem.*
3.1.7.1.g-08 *The Archive/Server Subsystem shall provide status indicators on the equipment front panels of all components that constitute the Archive/Server Subsystem.*
3.1.7.1.g-09 *The FQTM shall provide status indicators on the front panels of all components that constitute the FQTM Subsystem.*

3.1.7.1.h The DAS shall provide DAS Customer performance status data to the LCM.

3.1.7.1.h-01 *The DASCON Subsystem shall provide DAS Customer performance status data to the DASCON GUI.*

3.1.7.1.i Deleted.

3.1.7.1.j The DAS shall support the disabling of status of any component that constitutes the DAS from the LCM.

3.1.7.1.j-01 *The DASCON Subsystem shall support the disabling of status of any component that constitutes the DAS from the DASCON GUI.*

3.1.7.1.k The DAS shall support acknowledgement of an alert, allowing the alert to be cleared even though the abnormality still exists, so that a recurrence of an abnormality results in a new alert.

3.1.7.1.k-01 *The DASCON Subsystem shall support acknowledgement of an alert, allowing the alert to be cleared even though the abnormality still exists, so that a recurrence of an abnormality results in a new alert.*

3.1.7.2 Customer Performance Status

The purpose of this function is to collect and report performance status for Customer services.

Requirements

3.1.7.2.a The DAS shall provide performance status data to the DAS Customer, if requested.

3.1.7.2.a-01 *The DASCON Subsystem shall provide performance status data to the DAS Customer via SWSI, if requested.*

3.1.7.2.b The DAS shall report the DAS Customer receive frequency in the performance status data.

3.1.7.2.b-01 *The DASCON Subsystem shall report the DAS Customer receive frequency in the performance status data.*

3.1.7.3 Service Accounting Reporting

The purpose of this function is to provide service accounting statistics on all DAS Customer services.

Requirements

3.1.7.3.a The DAS shall provide service accounting statistics to the DAS LCM.

3.1.7.3.a-01 *The DASCON Subsystem shall provide service accounting statistics to the DASCON GUI.*

3.1.7.3.b The DAS shall allow the definition of a window for the service accounting statistics report to be input from the DAS LCM.

3.1.7.3.b-01 *The DASCON Subsystem shall allow the definition of a window for the service accounting statistics report to be input from the DASCON GUI.*

3.1.7.3.c The DAS shall report the duration of approved requests to the DAS LCM for the window specified.

3.1.7.3.c-01 *The DASCON Subsystem shall report the duration of approved requests to the DASCON GUI for the window specified.*

3.1.7.3.d The DAS shall report the duration of actual DAS Customer supported events for the window specified.

3.1.7.3.d-01 The DASCON Subsystem shall report the duration of actual DAS Customer supported events for the window specified.

3.1.7.3.e The DAS shall report the cumulative service accounting statistics for each DAS Customer for the window specified.

3.1.7.3.e-01 The DASCON Subsystem shall report the cumulative service accounting statistics for each DAS Customer for the window specified.

3.1.7.3.f The DAS shall report the cumulative service accounting statistics for each TDRS for the window specified.

3.1.7.3.f-01 The DASCON Subsystem shall report the cumulative service accounting statistics for each TDRS for the window specified.

3.1.7.3.g The DAS shall report the cumulative service accounting statistics for all DAS supported events for the window specified.

3.1.7.3.g-01 The DASCON Subsystem shall report the cumulative service accounting statistics for all DAS supported events for the window specified.

3.1.7.3.h The DAS shall support printing of the service accounting statistics report.

3.1.7.3.h-01 The DASCON Subsystem shall support printing of the service accounting statistics report.

3.1.8 System Operations

3.1.8.1 DAS Operations Control

The purpose of this function is to provide automated startup and shutdown control of the DAS.

Requirements

3.1.8.1.a The DAS shall place itself in a fully operational return data processing state in response to a system startup command.

3.1.8.1.a-01 The EMC Interface Subsystem shall place itself in a fully operational return data processing state in response to a system startup command.
3.1.8.1.a-02 The Beamformer Subsystem shall place itself in a fully operational return data processing state in response to a system startup command.
3.1.8.1.a-03 The ICON Subsystem shall place itself in a fully operational return data processing state in response to a system startup command.
3.1.8.1.a-04 The DASCON Subsystem shall place itself in a fully operational to support return data processing in response to a DASCON Subsystem startup command.
3.1.8.1.a-05 The IF Switch Subsystem shall place itself in a fully operational return data processing state in response to a system startup command.

3.1.8.1.a-06 *The DCON Subsystem shall place itself in a fully operational return data processing state in response to a system startup command.*

3.1.8.1.a-07 *The Demodulator Subsystem shall place itself in a fully operational return data processing state in response to a system startup command.*

3.1.8.1.a-08 *The Archive/Server Subsystem shall place itself in a fully operational return data processing state in response to a system startup command.*

3.1.8.1.a-09 *The FQTM Subsystem shall place itself in a fully operational return data processing state in response to a system startup command.*

3.1.8.1.b The DAS shall retain its current operational state resource allocation.

3.1.8.1.b-01 *The DASCON Subsystem shall retain its current operational state resource allocation.*

3.1.8.1.b-02 *The ICON Subsystem shall retain its current operational state resource allocation.*

3.1.8.1.b-03 *The DCON Subsystem shall retain its current operational state resource allocation.*

3.1.8.1.c After a restart operations command has been issued, the DAS shall restore service to its last operational state.

3.1.8.1.c-01 *After a restart operations command has been issued, the DASCON Subsystem shall restore service to its last operational state.*

3.1.8.1.c-02 *After a restart operations command has been issued, the ICON Subsystem shall restore service to its last operational state.*

3.1.8.1.c-03 *After a restart operations command has been issued, the DCON Subsystem shall restore service to its last operational state.*

3.1.8.1.d The DAS shall report incremental status during the start up operations sequence to the DAS LCM.

3.1.8.1.d-01 *The DASCON Subsystem shall report incremental status during the start up operations sequence to the DASCON GUI.*

3.1.8.1.d-02 *The ICON Subsystem shall report incremental status during the start up operations sequence to the ICON GUI.*

3.1.8.1.d-03 *The DCON Subsystem shall report incremental status during the start up operations sequence to the DCON GUI.*

3.1.8.1.e The DAS shall shutdown its operations in an orderly fashion in response to a system operations termination command.

3.1.8.1.e-01 *The EMC Interface Subsystem shall shutdown its operations in an orderly fashion in response to a system operations termination command.*

3.1.8.1.e-02 *The Beamformer Subsystem shall shutdown its operations in an orderly fashion in response to a system operations termination command.*

3.1.8.1.e-03 *The ICON Subsystem shall shutdown its operations in an orderly fashion in response to a system operations termination command.*

3.1.8.1.e-04 *The DASCON Subsystem shall shutdown its operations in an orderly fashion in response to a system operations termination command.*

3.1.8.1.e-05 *The DCON Subsystem shall shutdown its operations in an orderly fashion in response to a system operations termination command.*

3.1.8.1.e-06 *The IF Switch Subsystem shall shutdown its operations in an orderly fashion in response to a system operations termination command.*

3.1.8.1.e-07 *The Demodulator Subsystem shall shutdown its operations in an orderly fashion in response to a system operations termination command*

3.1.8.1.e-08 *The Archive/Server Subsystem shall shutdown its operations in an orderly fashion in response to a system operations termination command.*

3.1.8.1.e-09 *The FQTM shall shutdown its operations in an orderly fashion in response to a system operations termination command.*

3.1.8.1.f The DAS shall report incremental status during the shut down operations sequence to the DAS LCM.

3.1.8.1.f-01 *The DASCON Subsystem shall report incremental status during the shut down operations sequence to the DASCON GUI.*

3.1.8.1.f-02 *The ICON Subsystem shall report incremental status during the shut down operations sequence to the ICON GUI.*

3.1.8.1.f-03 *The DCON Subsystem shall report incremental status during the shut down operations sequence to the DCON GUI.*

3.1.8.1.g The DAS shall detect changes in the DAS internal configuration data to automatically adjust to changes in the system resources during normal operations.

3.1.8.1.g-01 *The DASCON Subsystem shall detect changes in the DAS internal configuration data to automatically adjust to changes in the system resources during normal operations.*

3.1.8.1.g-02 *The ICON Subsystem shall detect changes in the DAS internal configuration data to automatically adjust to changes in the system resources during normal operations.*

3.1.8.1.g-03 *The DCON Subsystem shall detect changes in the DAS internal configuration data to automatically adjust to changes in the system resources during normal operations.*

3.1.8.2 System Resource Configuration Update

The purpose of this function is to allow DAS resources to be added to or removed from the shared pool of resources.

Requirements

3.1.8.2.a The DAS shall support adding and removing DAS resources from the pool of shared resources from the DAS LCM.

3.1.8.2.a-01 *The DASCON Subsystem shall support adding and removing DAS resources from the pool of shared resources from the DASCON GUI.*

3.1.8.2.a-02 *The ICON Subsystem shall support adding and removing DAS resources from the pool of shared resources from the DASCON GUI.*

3.1.8.2.a-03 *The DCON Subsystem shall support adding and removing DAS resources from the pool of shared resources from the DASCON GUI.*

3.1.8.2.b The DAS shall change the allocation of resources assigned to the shared pool of resources without interrupting normal DAS operations.

3.1.8.2.b-01 *The DASCON Subsystem shall change the allocation of resources assigned to the shared pool of resources without interrupting normal DAS operations.*

3.1.8.2.b-02 *The ICON Subsystem shall change the allocation of resources assigned to the shared pool of resources without interrupting normal DAS operations.*

3.1.8.2.b-03 *The DCON Subsystem shall change the allocation of resources assigned to the shared pool of resources without interrupting normal DAS operations.*

3.1.8.3 Customer Data Update

The purpose of this function is to modify the DAS Customer identification data.

Requirements

3.1.8.3.a The DAS shall allow only authorized personnel to access DAS Customer authentication and authorization data.

3.1.8.3.a-01 *The SWSI System shall allow only authorized personnel to access DAS Customer authentication and authorization data.*

3.1.8.3.b The DAS shall retain Customer authentication and authorization data.

3.1.8.3.b-01 *The SWSI System shall retain Customer authentication and authorization data.*

3.1.8.3.c The DAS shall allow authorized personnel to modify DAS Customer identification parameters without interrupting normal DAS operations.

3.1.8.3.c-01 *The DASCON Subsystem shall allow authorized personnel to modify DAS Customer identification parameters through SWSI primarily or through DASCON GUI as backup without interrupting normal DAS operations.*

3.1.8.3.d The DAS shall allow the addition of new DAS Customers without interrupting DAS operations.

3.1.8.3.d-01 *The DASCON Subsystem shall allow the addition of new DAS Customers without interrupting DAS operations.*

3.1.8.3.e The DAS shall allow the deletion of existing DAS Customers without interrupting DAS operations.

3.1.8.3.e-01 *The DASCON Subsystem shall allow the deletion of existing DAS Customers without interrupting DAS operations.*

3.1.8.3.f The DAS shall report the stored Customer authentication and authorization data to authorized personnel only.

3.1.8.3.f-01 *The SWSI System shall report the stored Customer authentication and authorization data to authorized personnel only.*

3.1.9 Modular Expansion

Requirements

3.1.9.a The DAS implementation shall provide for modular expandability of beamformers.

3.1.9.a-01 The EMC Interface Subsystem implementation shall provide for modular expandability of Beamformers.

3.1.9.a-02 The Beamformer Subsystem implementation shall provide for modular expandability of Beamformers.

3.1.9.a-03 The ICON Subsystem implementation shall provide for modular expandability of beamformer.

3.1.9.a-04 The IF Switch Subsystem implementation shall provide for modular expandability of Beamformers.

3.1.9.a-05 The DASCON Subsystem implementation shall provide for modular expandability of Beamformers.

3.1.9.a-06 The Mechanical and Power Subsystem implementation shall provide for modular expandability of Beamformers.

3.1.9.a-07 The DCON Subsystem implementation shall provide for modular expandability of Beamformers.

3.1.9.b The DAS implementation shall provide for modular expandability of demodulators.

3.1.9.b-01 The Demodulator Subsystem implementation shall provide for modular expandability of demodulators.

3.1.9.b-02 The DCON Subsystem implementation shall provide for modular expandability of demodulators.

3.1.9.b-03 The IF Switch Subsystem implementation shall provide for modular expandability of demodulators.

3.1.9.b-04 The DASCON Subsystem implementation shall provide for modular expandability of demodulators.

3.1.9.b-05 The Mechanical and Power Subsystem implementation shall provide for modular expandability of demodulators

3.1.9.b-06 The FQTM Subsystem implementation shall provide for modular expandability of demodulators.

3.1.9.b-07 The Archive/Server Subsystem implementation shall provide for modular expandability of demodulators.

3.1.9.c The DAS implementation shall provide for modular expandability for archiving Customer data.

3.1.9.c-01 The Archive/Server Subsystem shall provide for modular expandability for archiving Customer data.

3.1.9.d The DAS implementation shall provide for modular expandability for routing Customer data.

3.1.9.d-01 The Archive/Server Subsystem implementation shall provide for modular expandability for routing Customer data.

3.1.9.e The DAS implementation shall provide for modular expandability for processing function.

3.1.9.e-01 The Archive/Server Subsystem shall provide for modular expandability for processing function.

3.1.9.f The DAS shall provide for modular expandability for upgrades to support future CCSDS compatible telemetry formats.

3.1.9.f-01 The Archive/Server Subsystem implementation shall provide for modular expandability for upgrades to support future CCSDS compatible telemetry formats.

3.2 PERFORMANCE REQUIREMENTS

3.2.1 Customer Interactions Management

Requirements

3.2.1.a The DAS shall report the results of a DAS Customer authentication check within 10 seconds of the receipt of the logon request.

3.2.1.a-01 The SWSI System shall report the results of a DAS Customer authentication check within 10 seconds of the receipt of the logon request.

3.2.1.1 Customer Resource Configuration Management

Requirements

3.2.1.1.a The DAS shall permit each DAS Customer to simultaneously maintain up to 10 resource allocation configuration data sets.

3.2.1.1.a-01 The SWSI System shall permit each DAS Customer to simultaneously maintain up to 10 resource allocation configuration data sets.

3.2.2 Resource Management

3.2.2.1 Resource Status Assessment

Requirements

3.2.2.1.a The DAS shall automatically log resource allocation status at 1-minute intervals.

3.2.2.1.a-01 The DASCON Subsystem shall automatically log resource allocation status in at least 1-minute intervals.

3.2.2.1.b The DAS shall automatically report resource allocation status at 1-minute intervals.

3.2.2.1.b-01 The DASCON Subsystem shall automatically report resource allocation status in at least 1-minute intervals at the DASCON GUI.

3.2.2.2 Resource Availability Assessment

3.2.2.2.1 Visibility Time Windows

Requirements

3.2.2.2.1.a The DAS shall assess visibility time windows at least 72 hours into the future for the time interval contained within a resource allocation request for a non-dedicated Customer.

3.2.2.2.1.a-01 The DASCON Subsystem shall assess visibility time windows at least 72 hours into the future for the time interval contained within the resource allocation request for a non-dedicated Customer.

3.2.2.2.1.b The DAS shall assess visibility time windows at least 24 hours greater than the windows computed in 3.2.2.2.1.a for the time interval contained within a resource allocation request for a dedicated Customer.

3.2.2.2.1.b-01 The DASCON Subsystem shall assess visibility time windows at least 24 hours greater than windows computed in 3.2.2.2.1.a for the time interval contained within a resource allocation request for a dedicated Customer.

3.2.2.2.2 Resource Allocation Options

Requirements

3.2.2.2.2.a The DAS shall assess resource allocation availability at least 72 hours into the future for the time interval contained within a resource allocation request.

3.2.2.2.2.a-01 The DASCON Subsystem shall assess resource allocation availability at least 72 hours into the future for the time interval contained within a resource allocation request.

3.2.2.3 DAS Resource Allocations

3.2.2.3.1 Resource Assignment

Requirements

3.2.2.3.1a When a customer request is being supported by a single TDRS, DAS shall execute TDRS to TDRS transitions when the angle from zenith of the upcoming TDRS is equal to or smaller than the angle from zenith of the current TDRS as viewed from the DAS Customer satellite's center of mass.

3.2.2.3.1a-01 When a customer request is being supported by a single TDRS, the DASCON Subsystem shall execute TDRS to TDRS transitions when the angle from zenith of the upcoming TDRS is equal to or smaller than the angle from zenith of the current TDRS as viewed from the DAS Customer satellite's center of mass.

3.2.2.3.1.b The DAS shall execute TDRS to TDRS transitions with no more than 15 seconds of service outage.

3.2.2.3.1.b-01 The DASCON Subsystem shall execute TDRS to TDRS transitions with no more than 5 seconds of service outage.

3.2.2.3.1.b-02 In conjunction with the DCON Subsystem, the ICON Subsystem shall execute TDRS to TDRS transitions with no more than 5 seconds of service outage.

3.2.2.3.1.b-03 In conjunction with the ICON Subsystem, the DCON Subsystem shall execute TDRS to TDRS transitions with no more than 5 seconds of service outage.

3.2.2.3.1.b-04 In conjunction with the Beamformer Subsystem, the Demodulator Subsystem shall execute TDRS to TDRS transitions with no more than 5 seconds of service outage.

3.2.2.3.1.b-05 In conjunction with the Demodulator Subsystem, the Beamformer Subsystem shall execute TDRS to TDRS transitions with no more than 5 seconds of service outage.

3.2.2.3.1.c The DAS shall provide status updates to the DAS Customers within 1 minute of a resource allocation change after commencement of service.

3.2.2.3.1.c-01 The DASCON Subsystem shall provide status updates to DAS Customers through SWSI within 1 minute of a resource allocation change after commencement of service.

3.2.2.3.1.d The DAS shall accept resource allocation requests that are to be implemented within 30 seconds after the receipt of the request.

3.2.2.3.1.d-01 The DASCON Subsystem shall accept resource allocation requests that are to be implemented within 30 seconds after the receipt of the request.

3.2.2.3.1.e The DAS shall notify the DAS Customer when the resource request is approved and which TDRS(s) will support the request, including any TDRS to TDRS transitions.

3.2.2.3.1.e-01 The DASCON Subsystem shall notify the DAS Customer through SWSI when the resource request is approved and which TDRS(s) will support the request, including any TDRS to TDRS transitions.

3.2.2.3.1.f The DAS shall notify the DAS customer at the service start time of the inability to support an accepted request.

3.2.2.3.1.f-01 The DASCON Subsystem shall notify the DAS customer through SWSI at the service start time of the inability to support an accepted request.

3.2.2.3.2 Resource Assignment Modification

Requirements

3.2.2.3.2.a The DAS shall implement allocation modification requests within 30 seconds of receipt of the request.

3.2.2.3.2.a-01 The DASCON Subsystem shall implement allocation modification requests within 30 seconds of receipt of the request.

3.2.2.3.2.b The DAS shall reject resource allocation modifications within 1 minute prior to the time that the service is terminated.

3.2.2.3.2.b-01 The DASCON Subsystem shall reject resource allocation modifications within 1 minute prior to the time that the service is terminated.

3.2.2.4 Vector Data Management

3.2.2.4.1 TDRS Ephemerides Generation

Requirements

3.2.2.4.1.a The DAS shall maintain no more than 96 hours of propagated TDRS ephemerides.

3.2.2.4.1.a-01 The DASCON Subsystem shall maintain no more than 96 hours of propagated TDRS ephemerides.

3.2.2.4.2 Customer Ephemerides Generation

Requirements

3.2.2.4.2.a The DAS shall notify a DAS Customer 2 hours prior to the time that an ephemeris update is due if a state vector update has not been received.

3.2.2.4.2.a-01 The DASCON Subsystem shall notify a DAS Customer through SWSI 2 hours prior to the time that an ephemeris update is due if a state vector update has not been received.

3.2.2.4.2.b The DAS shall maintain no more than 96 hours of propagated DAS Customer ephemerides.

3.2.2.4.2.b-01 The DASCON Subsystem shall maintain no more than 96 hours of propagated DAS Customer ephemerides.

3.2.2.4.2.c The DAS shall ensure that propagated ephemeris is available 2 minutes prior to the start of the DAS Customer requested support.

3.2.2.4.2.c-01 The DASCON Subsystem shall ensure that propagated ephemeris is available 2 minutes prior to the start of the DAS Customer requested support.

3.2.2.4.2.d The DAS shall maintain Type 8 vector data indefinitely.

3.2.2.4.2.d-01 The DASCON Subsystem shall maintain Type 8 vector indefinitely.

3.2.3 MAR Beamforming

3.2.3.1 Beamforming

Requirements

3.2.3.1.a The DAS shall form a beam such that the C/N_o of the formed beam is within 0.5 dB of the algebraic sum of the individual C/N_o's of the 30 element channels. (This assumes that the loss due to direction cosines inaccuracies is ≤ 0.05 dB, and the loss due to the EMC-provided calibration vector is ≤ 0.35 dB).

3.2.3.1.a-01 *The Beamformer Subsystem shall form a beam such that the C/N_o of the formed beam is within 0.5 dB of the algebraic sum of the individual C/N_o's of the 30 element channels. (This assumes that the loss due to direction cosines inaccuracies is ≤ 0.05 dB, and the loss due to the EMC-provided calibration vector is ≤ 0.35 dB).*

3.2.3.1.b The DAS shall generate weights such that the calculated transfer function (gain and phase) of the sum signal does not change as a result of the update, as long as the calibration vector is constant.

3.2.3.1.b-01 *The Beamformer Subsystem shall generate weights such that the calculated transfer function (gain and phase) of the sum signal does not change as a result of the update, as long as the calibration vector is constant.*

3.2.3.1c The DAS shall form simultaneous independent beams independently.

3.2.3.1c-01 *The Beamformer Subsystem shall form simultaneous independent beams independently.*

3.2.3.1.d The DAS shall have the capability of forming a beam centered at any commandable angle within a cone of 27° solid angle centered on the boresight of the TDRS MA antenna array.

3.2.3.1.d-01 *The Beamformer Subsystem shall have the capability of forming a beam centered at any commandable angle within a cone of 27° solid angle centered on the boresight of the TDRS MA antenna array.*

3.2.3.1.e The DAS shall output a beamformed signal with an output signal level of –4 dBm ± 2.0 dBm for a nominal input signal level of -20 dBFS.

3.2.3.1.e-01 *The Beamformer Subsystem shall output a beamformed signal with an output signal level of –4 dBm ± 2.0 dBm for a nominal input signal level of -20 dBFS.*

3.2.3.1.f The DAS shall output a beamformed signal that linearly follows the input signal level (within ± 0.5 dB) over the dynamic range of –12.3 dB to + 4 dB about the nominal input signal level of -20 dBFS.

3.2.3.1.f-01 *The Beamformer Subsystem shall output a beamformed signal that linearly follows the input signal level (within ± 0.5 dB) over the dynamic range of –12.3 dB to + 4 dB about the nominal input signal level of -20 dBFS.*

3.2.3.1.g The DAS shall reestablish all Customer beams within 10 seconds following a loss and subsequent restoration of the EMC output signals.

3.2.3.1.g-01 *The Beamformer Subsystem shall reestablish all Customer beams within 10 seconds following a loss and subsequent restoration of the EMC output signals.*

3.2.3.1.h In adaptive beamforming mode, the DAS shall form a null on an interfering signal within 2 seconds from the time the covariance matrix 'containing' the interferer is provided to the DAS from the EMC.

3.2.3.1.h-01 *In the TGBFS adaptive beamforming mode, the Beamformer Subsystem shall form a null on an interfering signal within 2 seconds from the time the covariance matrix 'containing' the interferer is provided to the DAS from the EMC.*

3.2.3.1.i In adaptive beamforming mode, the DAS shall automatically null interfering signals by implementing an algorithm that maximizes the Customer signal to interference plus noise ratio in the 6 MHz channel bandwidth.

3.2.3.1.i-01 *In the TGBFS adaptive beamforming mode, the Beamformer Subsystem shall automatically null interfering signals by implementing an algorithm that maximizes the Customer signal to interference plus noise ratio in the 6 MHz channel bandwidth.*

3.2.3.1.j In adaptive beamforming mode, for a single interferer having a level of 10 dB above the average element power and located outside the main lobe, the DAS shall null the interferer by at least 10 dB, for 95 percent of all possible combinations of main lobe positions and interferer locations for null locations which are fixed points on the surface of the earth.

3.2.3.1.j-01 *In the TGBFS adaptive beamforming mode, for a single interferer having a level of 10 dB above the average element power and located outside the main lobe, the Beamformer Subsystem shall null the interferer by at least 10 dB, for 95 percent of all possible combinations of main lobe positions and interferer locations for null locations which are fixed points on the surface of the earth.*

3.2.3.1.k In adaptive beamforming mode, for a single interferer having a level of 10 dB above the average element power and located outside the main lobe, the DAS shall null the interferer by at least 10 dB, for 95 percent of all possible combinations of main lobe positions and interferer locations with the main lobe which is defined as a cone of 3° of solid angle, centered about the commanded pointing direction.

3.2.3.1.k-01 *In adaptive beamforming mode, for a single interferer having a level of 10 dB above the average element power and located outside the main lobe, the Beamformer Subsystem shall null the interferer by at least 10 dB, for 95 percent of all possible combinations of main lobe positions and interferer locations with the main lobe which is defined as a cone of 3° of solid angle, centered about the commanded pointing direction.*

3.2.3.1.l In adaptive beamforming mode, the DAS shall update beam weights at a rate sufficient to maintain the required null depth while meeting the required beam quality, for maximum Customer to interferer angular velocities of 0.00033 radians per second.

3.2.3.1.l-01 *In adaptive beamforming mode, the Beamformer Subsystem shall update beam weights at a rate sufficient to maintain the required null depth while meeting the required beam quality, for maximum Customer to interferer angular velocities of 0.00033 radians per second.*

3.2.3.1.m In adaptive beamforming mode, the adaptive nulling requirements shall apply to (Continuous Wave) CW interferers and to interferers of any spectral composition within the 6 MHz element channel bandwidth.

3.2.3.1.m-01 *For the Beamformer Subsystem in the adaptive beamforming mode, the adaptive nulling requirements shall apply to (Continuous Wave) CW interferers and to interferers of any spectral composition within the 6 MHz element channel bandwidth.*

3.2.3.1.n In adaptive beamforming mode, beamforming requirements 3.2.3.1.a through 3.2.3.1.m shall apply during nulling, except for output C/No.

3.2.3.1.n-01 *For the Beamformer Subsystem in the adaptive beamforming mode, beamforming requirements 3.2.3.1.a through 3.2.3.1.m shall apply during nulling, except for output C/No.*

3.2.4 Signal Demodulation

3.2.4.1 Demodulation Selection

Requirements

3.2.4.1.a Each beamformer output shall be connected to any pre-assigned set of up to 16 demodulator inputs.

3.2.4.1.a-01 The IF Switch Subsystem shall connect each beamformer output to any pre-assigned set of up to 16 demodulator inputs.

3.2.4.2 Demodulation

3.2.4.2.1 Return Data Retrieval

3.2.4.2.1.1 Signal Parameters

Requirements

3.2.4.2.1.1.a The DAS shall support a return link signal with a Customer Emitter Frequency (F1) equal to the Customer Emitter Oscillator with a Customer Emitter oscillator frequency uncertainty as defined for Mode A and Mode B.

- Mode A denotes when the Customer Emitter oscillator frequency uncertainty is less than $\pm$ 700 Hz.
- Mode B denotes the case when the uncertainty is less than $\pm$ 3 kHz.

3.2.4.2.1.1.a-01 *The Demodulator Subsystem shall support a return link signal with a Customer Emitter Frequency (F1) equal to the Customer Emitter Oscillator with a Customer Emitter oscillator frequency uncertainty as defined for Mode A and Mode B plus Doppler frequency uncertainties.*

- *Mode A denotes when the Customer Emitter oscillator frequency uncertainty is less than $\pm$1.8KHz.*
- *Mode B denotes the case when the uncertainty is less than $\pm$ 4.1KHz.*

3.2.4.2.1.1.b The DAS shall support a return link signal with PN Code Modulation of SQPN.

3.2.4.2.1.1.b-01 The Demodulator Subsystem shall support a return link signal with PN Code Modulation of SQPN.

3.2.4.2.1.1.c The DAS shall support a return link signal with PN Chip Rate (Chips/Sec) of $\frac{31}{240 \times 96} \times F_1$

3.2.4.2.1.1.c-01 The Demodulator Subsystem shall support a return link signal with PN Chip Rate of 3.077799479166 MHz with state F1 (2.2875GHz) or $\frac{31}{240 \times 96} \times F_1$ *(Chips/Sec)*

3.2.4.2.1.1.d The DAS shall support a return link signal with PN Code Length (Chips) of $2^{11} - 1$.

3.2.4.2.1.1.d-01 The Demodulator Subsystem shall support a return link signal with PN Code Length (Chips) of $2^{11} - 1$.

3.2.4.2.1.1.e The DAS shall support a return link signal with PN Code Epoch Reference in the I Channel equal to the Customer Emitter Oscillator.

3.2.4.2.1.1.e-01 The Demodulator Subsystem shall support a return link signal with PN Code Epoch Reference in the I Channel equal to the Customer Emitter Oscillator.

3.2.4.2.1.1.f The DAS shall support a return link signal with PN Code Epoch Reference in the Q Channel equal to the Epoch delayed ½ PN Code Chip Period Relative to I Channel PN Code Epoch.

3.2.4.2.1.1.f-01 The Demodulator Subsystem shall support a return link signal with PN Code Epoch Reference in the Q Channel equal to the Epoch delayed ½ PN Code Chip Period Relative to I Channel PN Code Epoch.

3.2.4.2.1.1.g The DAS shall support a return link signal with PN Code Family of Gold Codes, Per 451-PN Code-SNIP.

3.2.4.2.1.1.g-01 The Demodulator Subsystem shall support a return link signal with PN Code Family of Gold Codes, Per 451-PN Code-SNIP.

3.2.4.2.1.1.h The DAS shall support a return link signal with Symbol Format NRZ, and BIΦ-L. If the transmitted symbol format is NRZ to BIΦ-L converted, there will be no G2 inversion.

3.2.4.2.1.1.h-01 The Demodulator Subsystem shall support a return link signal with Symbol Format NRZ, and BIΦ-L. If the transmitted symbol format is NRZ to BIΦ-L converted, there will be no G2 inversion.

3.2.4.2.1.1.i The DAS shall support a return link signal with Data Format of NRZ-L, NRZ-M, and NRZ-S.

3.2.4.2.1.1.i-01 The Demodulator Subsystem shall support a return link signal with Data Format of NRZ-L, NRZ-M, and NRZ-S.

3.2.4.2.1.1.j The DAS shall support a return link signal with Data Modulation of Modulo-2 added asynchronously to PN Code on each Channel; SQPN

3.2.4.2.1.1.j-01 The Demodulator Subsystem shall support a return link signal with Data Modulation of Modulo-2 added asynchronously to PN Code on each Channel; SQPN

3.2.4.2.1.1.k The DAS shall support a total return link signal with a Data Rate Restriction of 1 – 300 kbps.

3.2.4.2.1.1.k-01 The Demodulator Subsystem shall support a total return link signal with a Data Rate Restriction of 1 – 300 kbps.

3.2.4.2.1.1.l The DAS shall support a return link signal with an I CHANNEL Data Rate Restriction of 1 – 150 kbps.

3.2.4.2.1.1.l-01 The Demodulator Subsystem shall support a return link signal with an I CHANNEL Data Rate Restriction of 1 – 150 kbps.

3.2.4.2.1.1.m The DAS shall support a return link signal with a Q CHANNEL Data Rate Restriction of 1 – 150 kbps.

3.2.4.2.1.1.m-01 The Demodulator Subsystem shall support a return link signal with a Q CHANNEL Data Rate Restriction of 1 – 150 kbps.

Data Signals on the I and Q Channels may be independent and asynchronous. If the I and Q channel data signals are independent, the sum of the data rates on the I and Q channel must not exceed 300 kb/sec. If the I and Q channel data signals are identical and synchronous (i.e., single data channel operations), the channel data rate must not exceed 150 kb/sec.

3.2.4.2.1.2 Input Signal Characteristics

The signal characteristics of the received DAS signal are:

- Maximum received isotropic power (Customer signal plus Customer-to-TDRS AWGN) of –2.1 dBFS.
- Minimum received isotropic power (Customer signal plus Customer-to-TDRS AWGN) of –34.1 dBFS.
- Nominal received isotropic power (Customer signal plus Customer-to-TDRS AWGN) of –20 dBFS.
- The input signal contains pulsed RFI with pulse widths up to 5 μs and pulse amplitudes up to 10 dB above the average received power.
- Frequency and PN chip rate signals dynamics will result from Customer spacecraft dynamics:

  $\dot{R}$ (Velocity) ≤ 12 km/sec^2,

  $\ddot{R}$ (Acceleration) ≤ 15 m/sec^2, and

  $\dddot{R}$ (Jerk) ≤ 0.02 m/sec^3

The Phase Noise of the received DAS signal is:

a) 1 Hz to 1 kHz $\leq 2.7°$ rms.

b) 1 kHz to 3 MHz $\leq 2.0°$ rms.

The data rate of the received DAS signal will be within 0.1% of the commanded data rate.

Requirements

3.2.4.2.1.2.a The DAS equipment shall not be damaged or cumulatively degraded by the input signal.

3.2.4.2.1.2.a-01 The Demodulator Subsystem shall not be damaged or cumulatively degraded by the input signal.

3.2.4.2.1.2.a-02 The EMC Interface Subsystem shall not be damaged or cumulatively degraded by the input signal.

3.2.4.2.1.2.a-03 The Beamformer Subsystem shall not be damaged or cumulatively degraded by the input signal.

3.2.4.2.1.2.a-04 The IF Switch Subsystem shall not be damaged or cumulatively degraded by the input signal.

3.2.4.2.1.2.a-05 The Archive/Server Subsystem shall not be damaged or cumulatively degraded by the input signal.

3.2.4.2.1.2.b The DAS shall not extend the effect of each pulse by more than 100 ns.

3.2.4.2.1.2.b-01 The Demodulator Subsystem shall not extend the effect of each pulse by more than 100 ns.

3.2.4.2.1.2.c The DAS shall provide for the operation of all signal-processing functions, from EMC output to baseband, in the presence of pulsed RFI.

3.2.4.2.1.2.c-01 The Beamformer Subsystem shall provide for the operation of all signal-processing functions, from EMC Interface Subsystem output to intermediate frequency (IF) in the presence of pulsed RFI.

3.2.4.2.1.2.c-02 The Demodulator Subsystem shall provide for the operation of all signal-processing functions, from intermediate frequency (IF) to baseband, in the presence of pulsed RFI.

3.2.4.2.1.2.c-03 The EMC Interface Subsystem shall provide for the operation of all signal-processing functions, from EMC output to Beamformer Subsystem input in the presence of pulsed RFI.

3.2.4.2.1.2.c-04 The IF Switch Subsystem shall provide for the operation of all signal-processing functions in the presence of pulsed RFI.

3.2.4.2.1.3 Input Signal Data Configurations

Requirements

3.2.4.2.1.3.a The DAS shall process input signals for Single Data Channel configurations of Balanced QPSK; synchronous, identical, convolutionally coded data on each of the I and Q Channels.

3.2.4.2.1.3.a-01 The Demodulator Subsystem shall process input signals for Single Data Channel configurations of Balanced QPSK; synchronous, identical, convolutionally coded data on each of the I and Q Channels.

3.2.4.2.1.3.b The DAS shall process input signals for Single Data Channel configurations of Unbalanced QPSK; synchronous, identical, convolutionally coded data on each of the I and Q Channels.

3.2.4.2.1.3.b-01 The Demodulator Subsystem shall process input signals for Single Data Channel configurations of Unbalanced QPSK; synchronous, identical, convolutionally coded data on each of the I and Q Channels.

3.2.4.2.1.3.c The DAS shall process input signals for Single Data Channel configurations of BPSK; convolutionally coded data.

3.2.4.2.1.3.c-01 The Demodulator Subsystem shall process input signals for Single Data Channel configurations of BPSK; convolutionally coded data.

3.2.4.2.1.3.d The DAS shall process input signals for Dual Data Channel configurations of two independent convolutionally coded (rate 1/2) data signals, one on the I Channel and one on the Q Channel.

3.2.4.2.1.3.d-01 The Demodulator Subsystem shall process input signals for Dual Data Channel configurations of two independent convolutionally coded (rate 1/2) data signals, one on the I Channel and one on the Q Channel.

3.2.4.2.1.4 Decoding Requirements

Requirements

3.2.4.2.1.4.a The DAS shall decode a signal with a convolutional, non-systematic, transparent code.

3.2.4.2.1.4.a-01 The Demodulator Subsystem shall decode a signal with a convolutional, non-systematic, transparent code.

3.2.4.2.1.4.b The DAS shall decode a signal with a rate of 1/2.

3.2.4.2.1.4.b-01 The Demodulator Subsystem shall decode a signal with a rate of 1/2.

3.2.4.2.1.4.c The DAS shall decode a signal with a Constraint Length of K = 7.

3.2.4.2.1.4.c-01 The Demodulator Subsystem shall decode a signal with a Constraint Length of K = 7.

3.2.4.2.1.4.d The DAS shall decode a signal with Generator Functions of G_1 = 1111001 and G_2 = 1011011.

3.2.4.2.1.4.d-01 The Demodulator Subsystem shall decode a signal with Generator Functions of G_1 = 1111001 and G_2 = 1011011.

3.2.4.2.1.4.e The DAS shall decode a signal with Symbols generated from G_1 that precede symbols generated from G_2 relative to the data bit period.

3.2.4.2.1.4.e-01 The Demodulator Subsystem shall decode a signal with Symbols generated from G_1 that precede symbols generated from G_2 relative to the data bit period.

3.2.4.2.1.4.f The DAS shall decode a signal with Symbols generated from G_2 that are either true or complemented as defined by the service specifications.

3.2.4.2.1.4.f-01 The Demodulator Subsystem shall decode a signal with Symbols generated from G_2 that are either true or complemented as defined by the service specifications.

3.2.4.2.1.5 Ambiguity Resolution

Requirements

Data Phase Ambiguity. Data Phase Ambiguity is the uncertainty that the logical sense of the data may be either true or complemented.

3.2.4.2.1.5.a The data phase ambiguity shall be resolved for all configurations and modes except when the data format is NRZ-L.

3.2.4.2.1.5.a-01 The Demodulator Subsystem shall resolve data phase ambiguity for all configurations and modes except when the data format is NRZ-L

3.2.4.2.1.5.b Deleted.

3.2.4.2.1.6 Probability of Error (P_E)

Probability of error performance (P_E) is defined as:

$C/N_O = E_b/N_O + 10 \log R_b + L(P_E, R_b)$

where:

- (C/N_O) = The formed beam C/No.
- P_E 10^{-5}
- R_b is the bit rate of the data channel.
- $L(P_E, R_b)$ is the allowable implementation loss.
- E_b/N_o is the theoretically required value for P_E in an Additive White Gaussian noise (AWGN) channel.

The performance requirements apply at the nominal input power levels defined in 3.2.4.2.1.2.

Requirements

3.2.4.2.1.6.a The $L(P_E, R_b)$ for an R_b of 1 kbps and P_E of 10^{-5} shall be 3.0 dB.

3.2.4.2.1.6.a-01 The EMC Interface Subsystem shall be allocated a $L(P_E, R_b)$ for an R_b of 1 kbps and P_E of 10^{-5} of 0.05 dB.

3.2.4.2.1.6.a-02 The Beamformer Subsystem shall be allocated a L(P_E, R_b) for an R_b of 1 kbps and P_E of 10^{-5} of 0.5 dB.

3.2.4.2.1.6.a-03 The Demodulator Subsystem shall be allocated a L(P_E, R_b) for an R_b of 1 kbps and P_E of 10^{-5} of 2.0 dB.

3.2.4.2.1.6.b The L(P_E, R_b) for an R_b of 10 kbps and P_E of 10^{-5} shall be 3.0 dB.

3.2.4.2.1.6.b-01 The EMC Interface Subsystem shall be allocated a L(P_E, R_b) for an R_b of 10 kbps and P_E of 10^{-5} of 0.05 dB.

3.2.4.2.1.6.b-02 The Beamformer Subsystem shall be allocated a L(P_E, R_b) for an R_b of 10 kbps and P_E of 10^{-5} of 0.5 dB.

3.2.4.2.1.6.b-03 The Demodulator Subsystem shall be allocated a L(P_E, R_b) for an R_b of 10 kbps and P_E of 10^{-5} of 2.0 dB.

3.2.4.2.1.6.c The L(P_E, R_b) for an R_b of 100 kbps and P_E of 10^{-5} shall be 3.0 dB.

3.2.4.2.1.6.c-01 The EMC Interface Subsystem shall be allocated a L(P_E, R_b) for an R_b of 100 kbps and P_E of 10^{-5} of 0.05dB.

3.2.4.2.1.6.c-02 The Beamformer Subsystem shall be allocated a L(P_E, R_b) for an R_b of 100 kbps and P_E of 10^{-5} of 0.5 dB.

3.2.4.2.1.6.c-03 The Demodulator Subsystem shall be allocated a L(P_E, R_b) for an R_b of 100 kbps and P_E of 10^{-5} of 2.0 dB.

3.2.4.2.1.6.d The L(P_E, R_b) for an R_b of 1 kbps and P_E of 10^{-6} shall be 3.2 dB.

3.2.4.2.1.6.d-01 The EMC Interface Subsystem shall be allocated a L(P_E, R_b) for an R_b of 1 kbps and P_E of 10^{-6} of 0.05 dB.

3.2.4.2.1.6.d-02 The Beamformer Subsystem shall be allocated a L(P_E, R_b) for an R_b of 1 kbps and P_E of 10^{-6} of 0.5 dB.

3.2.4.2.1.6.d-03 The Demodulator Subsystem shall be allocated a L(P_E, R_b) for an R_b of 1 kbps and P_E of 10^{-6} of 2.0 dB.

3.2.4.2.1.6.e The L(P_E, R_b) for an R_b of 10 kbps and P_E of 10^{-6} shall be 3.2 dB.

3.2.4.2.1.6.e-01 The EMC Interface Subsystem shall be allocated a L(P_E, R_b) for an R_b of 10 kbps and P_E of 10^{-6} of 0.05 dB.

3.2.4.2.1.6.e-02 The Beamformer Subsystem shall be allocated a L(P_E, R_b) for an R_b of 10 kbps and P_E of 10^{-6} of 0.5 dB.

3.2.4.2.1.6.e-03 The Demodulator Subsystem shall be allocated a L(P_E, R_b) for an R_b of 10 kbps and P_E of 10^{-6} of 2.0 dB.

3.2.4.2.1.6.f The L(P_E, R_b) for an R_b of 100 kbps and P_E of 10^{-6} shall be 3.2 dB.

3.2.4.2.1.6.f-01 The EMC Interface Subsystem shall be allocated a L(P_E, R_b) for an R_b of 100 kbps and P_E of 10^{-6} of 0.05 dB.

3.2.4.2.1.6.f-02 The Beamformer Subsystem shall be allocated a L(P_E, R_b) for an R_b of 100 kbps and P_E of 10^{-6} of 0.5 dB.

3.2.4.2.1.6.f-03 The Demodulator Subsystem shall be allocated a L(P_E, R_b) for an R_b of 100 kbps and P_E of 10^{-6} of 2.0 dB.

3.2.4.2.1.6.g The $L(P_E, R_b)$ for an R_b of 1 kbps and P_E of 10^{-7} shall be 3.4 dB.

3.2.4.2.1.6.g-01 The EMC Interface Subsystem shall be allocated a $L(P_E, R_b)$ for an R_b of 1 kbps and P_E of 10^{-7} of 0.05 dB.

3.2.4.2.1.6.g-02 The Beamformer Subsystem shall be allocated a $L(P_E, R_b)$ for an R_b of 1 kbps and P_E of 10^{-7} of 0.5 dB.

3.2.4.2.1.6.g-03 The Demodulator Subsystem shall be allocated a $L(P_E, R_b)$ for an R_b of 1 kbps and P_E of 10^{-7} of 2.0 dB.

3.2.4.2.1.6.h The $L(P_E, R_b)$ for an R_b of 10 kbps and P_E of 10^{-7} shall be 3.4 dB.

3.2.4.2.1.6.h-01 The EMC Interface Subsystem shall be allocated a $L(P_E, R_b)$ for an R_b of 10 kbps and P_E of 10^{-7} of 0.05 dB.

3.2.4.2.1.6.h-02 The Beamformer Subsystem shall be allocated a $L(P_E, R_b)$ for an R_b of 10 kbps and P_E of 10^{-7} of 0.5 dB.

3.2.4.2.1.6.h-03 The Demodulator Subsystem shall be allocated a $L(P_E, R_b)$ for an R_b of 10 kbps and P_E of 10^{-7} of 2.0 dB.

3.2.4.2.1.6.i The $L(P_E, R_b)$ for an R_b of 100 kbps and P_E of 10^{-7} shall be 3.4 dB.

3.2.4.2.1.6.i-01 The EMC Interface Subsystem shall be allocated a $L(P_E, R_b)$ for an R_b of 100 kbps and P_E of 10^{-7} of 0.05 dB.

3.2.4.2.1.6.i-02 The Beamformer Subsystem shall be allocated a $L(P_E, R_b)$ for an R_b of 100 kbps and P_E of 10^{-7} of 0.5 dB.

3.2.4.2.1.6.i-03 The Demodulator Subsystem shall be allocated a $L(P_E, R_b)$ for an R_b of 100 kbps and P_E of 10^{-7} of 2.0 dB.

3.2.4.2.1.6.j For NRZ-M and NRZ-S data formats, an additional implementation loss of 0.1 dB shall be allowed.

3.2.4.2.1.6.j-01 The Demodulator Subsystem shall be allocated an additional implementation loss of 0.1 dB for NRZ-M and NRZ-S data formats.

3.2.4.2.1.6.k The specified performance shall be achieved for each data channel at the decoder output.

3.2.4.2.1.6.k-01 When integrated with the Beamformer Subsystem, the Demodulator Subsystem shall support the measurement of the specified performance at the decoder output for each data channel.

The total element C/N_O is referenced at the DAS input and is defined as follows:

- QPSK; Dual Data Channel. The total element C/N_O is the sum of the I and Q Channel C/N_O's per element where the individual channel C/N_O's per element are each in accordance with the C/N_o formulation in 3.2.4.2.1.6.
- Balanced QPSK; Single Data Channel. The total element C/N_O is in accordance with the C/N_o formulation in 3.2.4.2.1.6.

- Unbalanced QPSK; Single Data Channel. The total element C/N_O is the sum of the I and Q Channel C/N_O's per element where only the strong channel C/N_O per element is in accordance with the C/N_O formulation in 3.2.4.2.1.6.

3.2.4.2.1.6.l For balanced QPSK; Single Data Channel, a maximum 0.1 dB additional implementation loss relative to requirements 3.2.4.2.1.6.a through 3.2.4.2.1.6.k shall be allowed.

3.2.4.2.1.6.l-01 The Demodulator Subsystem shall allow a maximum additional implementation loss of 0.1 dB relative to requirements 3.2.4.2.1.6.a through 3.2.4.2.1.6.k for balanced QPSK; Single Data Channels.

3.2.4.2.1.6.m The specified performance shall be achieved after signal acquisition has been completed and signal tracking has been achieved.

3.2.4.2.1.6.m-01 When integrated with the Beamformer Subsystem, the Demodulator Subsystem shall achieve the specified performance after signal acquisition has been completed and signal tracking has been achieved.

3.2.4.2.1.6.n The specified performance shall be achieved in the presence of Additive White Gaussian Noise.

3.2.4.2.1.6.n-01 When integrated with the Beamformer Subsystem, the Demodulator Subsystem shall achieve the specified performance in the presence of Additive White Gaussian Noise.

3.2.4.2.1.6.o The specified performance shall be achieved when the signals at the LNA input contain the signal characteristics of Paragraph 3.2.4.2.1.2.

3.2.4.2.1.6.o-01 When integrated with the Beamformer Subsystem, the Demodulator Subsystem shall achieve the specified performance when the signals at the LNA input contain the signal characteristics of Paragraph 3.2.4.2.1.2.

3.2.4.2.1.7 Acquisition

For signal acquisition, the DAS will be provided with vectors describing the Customer emitter dynamics. The vector will have an epoch time uncertainty of $\leq \pm 9$ seconds.

Requirements

PN Code and Carrier Acquisition.

3.2.4.2.1.7.a Acquisition time shall be measured from the instant at which sufficient C/N_o (as defined in 3.2.4.2.1.7 b, c and d) is present at the DAS input.

3.2.4.2.1.7.a-01 The Demodulator Subsystem acquisition time shall be measured from the instant at which sufficient C/N_o (as defined in 3.2.4.2.1.7 b, c and d) is present at the DAS input.

3.2.4.2.1.7.b Acquisition time shall include the time to acquire the PN code and carrier.

3.2.4.2.1.7.b-01 The Demodulator Subsystem acquisition time shall include the time to acquire the PN code and carrier.

3.2.4.2.1.7.c The acquisition time shall not exceed 1 second for a C/N_O value of 36.0 dB-Hz for Mode A or the C/N_o required for the $P_E = 10^{-5}$, whichever is greater and the signal dynamics indicated in Section 3.2.4.2.1.2.

- Mode A is defined to be such that the received carrier frequency uncertainties due to Customer emitter transmitter uncertainties will not exceed $\pm$ 700 Hz.
- For the 1:1 I/Q Channel Power Ratio Mode, the sum of the I and Q Channel C/N_O's will be equal to the specified value. For the 1:4 I/Q Channel Power Ratio Mode, the Q Channel C/N_O will be equal to the specified value. When one channel is absent such that the remaining channel is a BPSK signal, the C/N_O will be equal to the specified value.

3.2.4.2.1.7.c-01 The Demodulator Subsystem shall provide an acquisition time that does not exceed 1 second for a C/N_O value of 36.0 dB-Hz for Mode A or the C/N_o required for the $P_E = 10^{-5}$, whichever is greater and the signal dynamics indicated in Section 3.2.4.2.1.2.

- *Mode A is defined to be such that the received carrier frequency uncertainties due to Customer emitter transmitter uncertainties will not exceed $\pm$ 700 Hz.*
- *For the 1:1 I/Q Channel Power Ratio Mode, the sum of the I and Q Channel C/N_O's will be equal to the specified value. For the 1:4 I/Q Channel Power Ratio Mode, the Q Channel C/N_O will be equal to the specified value. When one channel is absent such that the remaining channel is a BPSK signal, the C/N_O will be equal to the specified value.*

3.2.4.2.1.7.d The acquisition time shall not exceed 3 seconds for a C/N_O value of 36.0 dB-Hz for Mode B or the C/N_o required for the $P_E = 10^{-5}$, whichever is greater and the signal dynamics indicated in Section 3.2.4.2.1.2.

- *Mode B is defined to be such that the received carrier frequency uncertainties due to Customer emitter transmitter uncertainties will not exceed $\pm$ 3 kHz.*
- *For the 1:1 I/Q Channel Power Ratio Mode, the sum of the I and Q Channel C/N_O's will be equal to the specified value. For the 1:4 I/Q Channel Power Ratio Mode, the Q Channel C/N_O will be equal to the specified value. When one channel is absent such that the remaining channel is a BPSK signal, the C/N_O will be equal to the specified value.*

3.2.4.2.1.7.d-01 The Demodulator Subsystem shall provide an acquisition time that shall not exceed 3 seconds for a C/N_O value of 36.0 dB-Hz for Mode B or the C/N_o required for the $P_E = 10^{-5}$, whichever is greater and the signal dynamics indicated in Section 3.2.4.2.1.2.

- *Mode B is defined to be such that the received carrier frequency uncertainties due to Customer emitter transmitter uncertainties will not exceed $\pm$ 3 kHz.*
- *For the 1:1 I/Q Channel Power Ratio Mode, the sum of the I and Q Channel C/N_O's will be equal to the specified value. For the 1:4 I/Q Channel Power Ratio Mode, the Q Channel C/N_O will be equal to the specified value. When one channel is absent*

such that the remaining channel is a BPSK signal, the C/N_O will be equal to the specified value.

3.2.4.2.1.7.e The probability of acquisition (P_{acq}) for the times specified in 3.2.4.2.1.7 b, c, and d shall be $\geq$ 0.9.

3.2.4.2.1.7.e-01 The Demodulator Subsystem shall achieve a probability of acquisition (P_{acq}) for the times specified in 3.2.4.2.1.7 b, c, and d that shall be $\geq$ 0.9.

3.2.4.2.1.7.f In the event that acquisition does not occur within the time specified, the PN code shall be searched until acquisition occurs, or until the end of scheduled service.

3.2.4.2.1.7.f-01 In the event that acquisition does not occur within the time specified, the Demodulator Subsystem shall search the PN code until acquisition occurs, or until the end of scheduled service.

The time to acquire includes time to search the PN code uncertainty.

3.2.4.2.1.8 Symbol/Decoder Synchronization

Symbol/Decoder Synchronization time is measured from the time carrier acquisition is achieved to the time decoder synchronization is achieved. Decoder synchronization is achieved when the Viterbi decoder has selected and implemented the correct blocking of the input symbols (into groups of (G1, G2) symbol pairs). Requirements for bit error probability and symbol slipping take effect at the time decoder synchronization is achieved.

For the purposes of decoder synchronization, the minimum data bit transition density will be 64 randomly distributed data bit transitions within any sequence of 512 data bits with no more than 64 consecutive data bits without a transition.

Requirements

3.2.4.2.1.8.a For the minimum symbol and data transition densities and the minimum specified C/N_O values required for 10^{-5} P_E performance, the time to achieve symbol/decoder synchronization (in seconds) shall not exceed 1100/(data rate in bps), with 99% probability for Biphase symbol formats. [Deviation Requested]

3.2.4.2.1.8.b For the minimum symbol and data transition densities and the minimum specified C/N_O values required for 10^{-5} P_E performance, the time to achieve symbol/decoder synchronization (in seconds) shall not exceed 6500/(data rate in bps), with 99% probability for NRZ symbol formats. [Deviation Requested]

3.2.4.2.1.9 Bit Slippage

Requirements

3.2.4.2.1.9.a Normal Transition Density: The mean time between slips caused by a cycle slip in the symbol clock recovery loop shall be either no less than 90 minutes or no less than 10^{10} clock cycles, whichever is greater, for the C/N_O required for 10^{-5} P_E performance. This

requirement applies for transition densities of at least 40% for NRZ symbols and any transition density for biphase symbols.

3.2.4.2.1.9.a-01 Normal Transition Density: The Demodulator Subsystem shall provide a mean time between slips caused by a cycle slip in the symbol clock recovery loop that shall be either no less than 90 minutes or no less than 10^{10} clock cycles, whichever is greater, for the C/N_o required for 10^{-5} P_E performance. This requirement applies for transition densities of at least 40% for NRZ symbols and any transition density for biphase symbols.

3.2.4.2.1.9.b Low Transition Density. The mean time between slips caused by a cycle slip in the symbol clock recovery loop shall be either no less than 90 minutes or no less than 10^{10} clock cycles, whichever is greater, for 1.0 dB more C/N_o than required for 10^{-5} P_E performance. This requirement applies for NRZ symbol transition densities between 25% and 40%.

3.2.4.2.1.9.b-01 Low Transition Density. The Demodulator Subsystem shall provide a mean time between slips caused by a cycle slip in the symbol clock recovery loop that shall be either no less than 90 minutes or no less than 10^{10} clock cycles, whichever is greater, for 1.0 dB more C/N_o than required for 10^{-5} P_E performance. This requirement applies for NRZ symbol transition densities between 25% and 40%.

3.2.4.2.1.10 Mean Time-to-Cycle Slip

Requirements

3.2.4.2.1.10.a The mean time-to-cycle slip in tracking the carrier shall be greater than or equal to 90 minutes for a 3 dB less C/N_o than required for 10^{-5} P_E performance.

3.2.4.2.1.10.a-01 The Demodulator Subsystem shall provide a mean time-to-cycle slip in tracking the carrier that shall be greater than or equal to 90 minutes for a 3 dB less C/N_o than required for 10^{-5} P_E performance.

3.2.4.2.1.11 False Acquisition

Requirements

3.2.4.2.1.11.a During signal acquisition and signal tracking, DAS services shall be protected against false carrier acquisition and false acquisition to PN code sidebands, including multipath. Multipath is defined as specular reflections with path delay > 700 nsec and < 5 msec, and < -6 dB with respect to the direct signal.

3.2.4.2.1.11.a-01 During signal acquisition and signal tracking, The Demodulator Subsystem shall be protected against false carrier acquisition and false acquisition to PN code sidebands, including multipath. Multipath is defined as specular reflections with path delay > 700 nsec and < 5 msec, and < -6 dB with respect to the direct signal.

3.2.4.2.1.12 Loss of Symbol Synchronization

For this requirement, maintenance of symbol synchronization is defined as a minimum mean time between symbol clock slips of 10^6 clock cycles.

Requirements

3.2.4.2.1.12.a Normal Transition Density. Symbol synchronization shall be maintained for 3 dB less C/N_O than required for 10^{-5} P_E performance. This requirement applies for transition densities of at least 40% for NRZ symbols and any transition density for biphase symbols.

3.2.4.2.1.12.a-01 Normal Transition Density. The Demodulator Subsystem shall maintain symbol synchronization for 3 dB less C/N_O than required for 10^{-5} P_E performance. This requirement applies for transition densities of at least 40% for NRZ symbols and any transition density for biphase symbols.

3.2.4.2.1.12.b Low Transition Density. Symbol synchronization shall be maintained for 2 dB less C/N_O than required for 10^{-5} P_E performance. This requirement applies for NRZ symbol transition densities between 25% and 40%.

3.2.4.2.1.12.b-01 Low Transition Density. The Demodulator Subsystem shall maintain Symbol synchronization for 2 dB less C/N_O than required for 10^{-5} P_E performance. This requirement applies for NRZ symbol transition densities between 25% and 40%

3.2.4.2.1.13 C/N_O Variation

Requirements

3.2.4.2.1.13.a The DAS shall accommodate an input C/N_O variation of 12 dB, at a rate not to exceed 10 dB/sec, without requiring a reconfiguration.

3.2.4.2.1.13.a-01 The Demodulator Subsystem shall accommodate an input C/N_O variation of 12 dB, at a rate not to exceed 10 dB/sec, without requiring a reconfiguration.

3.2.4.2.1.14 Additional Signal Distortions

Requirements

3.2.4.2.1.14.a The DAS shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: Data asymmetry $\leq \pm$ 3%.

3.2.4.2.1.14.a-01The Demodulator Subsystem shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: Data asymmetry $\leq \pm$ 3%.

3.2.4.2.1.14.b The DAS shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: Data transition time < 5% of symbol.

3.2.4.2.1.14.b-01The Demodulator Subsystem shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: Data transition time < 5% of symbol.

3.2.4.2.1.14.c The DAS shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: I/Q data skew (relative to requirements for I/Q data synchronization) < 3%.

3.2.4.2.1.14.c-01The Demodulator Subsystem shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: I/Q data skew (relative to requirements for I/Q data synchronization) < 3%.

3.2.4.2.1.14.d The DAS shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: I/Q PN chip skew (relative to 0.50 chip) < 0.01 chip.

3.2.4.2.1.14.d-01The Demodulator Subsystem shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: I/Q PN chip skew (relative to 0.50 chip) < 0.01 chip.

3.2.4.2.1.14.e The DAS shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: PN code power suppression < 0.3 dB.

3.2.4.2.1.14.e-01The Demodulator Subsystem shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: PN code power suppression < 0.3 dB.

3.2.4.2.1.14.f The DAS shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: PN chip rate (relative to absolute coherence with carrier rate) < 0.01 Hz at PN rate.

3.2.4.2.1.14.f-01The Demodulator Subsystem shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: PN chip rate (relative to absolute coherence with carrier rate) < 0.01 Hz at PN rate.

3.2.4.2.1.14.g The DAS shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: BPSK phase imbalance < ± 3°.

3.2.4.2.1.14.g-01The Demodulator Subsystem shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: BPSK phase imbalance < ± 3°.

3.2.4.2.1.14.h The DAS shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: Gain imbalance $\leq$ ± 0.25 dB.

3.2.4.2.h.14.l-01The Demodulator Subsystem shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: Gain imbalance $\leq$ ± 0.25 dB.

3.2.4.2.1.14.i The DAS shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: QPSK phase imbalance 90 ± 3°.

3.2.4.2.1.14.i-01 The Demodulator Subsystem shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: QPSK phase imbalance 90 ± 3°.

3.2.4.2.1.14.j The DAS shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: AM/PM $\leq$ 12°/dB.

3.2.4.2.1.14.j-01 The Demodulator Subsystem shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: AM/PM $\leq$ 12°/dB.

3.2.4.2.1.14.k The DAS shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: Spurious PM (100 Hz to 3 MHz) $\leq$ 3° rms.

3.2.4.2.1.14.k-01 The Demodulator Subsystem shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: Spurious PM (100 Hz to 3 MHz) $\leq$ 3° rms.

3.2.4.2.1.14.l The DAS shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: Incidental AM (3σ) (at frequencies > 10 Hz for data rates < 1 kbps; at frequencies > 100 Hz for data rates $\geq$ 1 kbps) $\leq$ 6%.

3.2.4.2.1.14.l-01 The Demodulator Subsystem shall provide for operation of all signal processing functions from EMC output to baseband with an input signal containing the following additional distortion: Incidental AM (3σ) (at frequencies > 10 Hz for data rates < 1 kbps; at frequencies > 100 Hz for data rates $\geq$ 1 kbps) $\leq$ 6%.

3.2.4.2.1.15 Deleted.

Requirements

3.2.4.2.1.15 Deleted.

3.2.4.2.1.16 Reacquisition

Requirements

3.2.4.2.1.16.a In the event of loss of lock (PN code and/or carrier) reacquisition shall be automatically initiated.

3.2.4.2.1.16.a-01 In the event of loss of lock (PN code and/or carrier) the Demodulator Subsystem shall automatically initiate reacquisition.

3.2.4.2.1.16.b The most recent commanded frequency offset shall be used to aid reacquisition.

3.2.4.2.1.16.b-01The Demodulator Subsystem shall use the most recent commanded frequency offset to aid reacquisition.

3.2.4.2.1.16.c Reacquisition time shall be less than or equal to the initial acquisition times specified in Section 3.2.4.2.1.7.c and 3.2.4.2.1.7.d.

3.2.4.2.1.16.c-01The Demodulator Subsystem reacquisition time shall be less than or equal to the initial acquisition times specified in Section 3.2.4.2.1.7.c and 3.2.4.2.1.7.d.

3.2.4.2.1.16.d Reacquisition shall continue until lock is achieved or DAS is reconfigured.

3.2.4.2.1.16.d-01 The Demodulator Subsystem shall reacquisition shall continue until lock is achieved or DAS is reconfigured.

3.2.4.2.2 Doppler Measurement

Requirements

3.2.4.2.2.a Deleted.
3.2.4.2.2.b Deleted.
3.2.4.2.2.c Deleted.
3.2.4.2.2.d Deleted.
3.2.4.2.2.e Deleted.
3.2.4.2.2.f Deleted.

3.2.5 Return Data Distribution

3.2.5.1 Deleted.

Requirements

3.2.5.1.a Deleted.

3.2.5.1.1 Return Data Formatting

Requirements

3.2.5.1.1.a The DAS shall support IP for routing data to Customers via Closed IOnet or dedicated Customer circuits.

3.2.5.1.1.a-01 The Archive/Server Subsystem shall support IP for routing data to Customers via Closed IOnet or dedicated Customer circuits.

3.2.5.1.1.b The DAS shall support frame sync based CCSDS protocol for routing data to Customers via Closed IOnet or dedicated Customer circuits.

3.2.5.1.1.b-01 The Archive/Server Subsystem shall support frame sync based CCSDS protocol for routing data to Customers via Closed IOnet or dedicated Customer circuits.

3.2.5.1.1.c Deleted.

3.2.5.1.1.d The DAS shall support the IP Data Unit (IPDU) ground transport header for return CCSDS telemetry formats (described in the GSFC Landsat 7/LGN ICD 430-14-01-001-0) for routing data to Customers via Closed IOnet and dedicated Customer circuits.

3.2.5.1.1.d-01 The Archive/Server Subsystem shall support the IP Data Unit (IPDU) ground transport header for return CCSDS telemetry formats (described in the GSFC Landsat 7/LGN ICD 430-14-01-001-0) for routing data to Customers via Closed IOnet and dedicated Customer circuits.

3.2.5.1.1.e The DAS shall support the Advanced Composition Explorer (ACE) Standard Formatted Data Unit (SFDU) ground transport header for return CCSDS telemetry formats (described in DSN Document TLM-3-27 and TLM-3-29) for routing data to Customers via Closed IOnet and dedicated Customer circuits.

3.2.5.1.1.e-01 The Archive/Server Subsystem shall support the Advanced Composition Explorer (ACE) Standard Formatted Data Unit (SFDU) ground transport header (described in DSN Document TLM-3-27 and TLM-3-29) *for return CCSDS telemetry formats for routing data to Customers via Closed IOnet and dedicated Customer circuits.*

3.2.5.1.1.f The DAS shall support the Advanced X-ray Astrophysics Facility-Imaging (AXAF-1) (SFDU) ground transport header for return CCSDS telemetry formats (described in DSN Document TLM-3-26 and TLM-3-29) for routing data to Customers via Closed IOnet and dedicated Customer circuits.

3.2.5.1.1.f-01 The Archive/Server Subsystem shall support the Advanced X-ray Astrophysics Facility-Imaging (AXAF-1) SFDU ground transport header for return CCSDS telemetry formats (described in DSN Documents TLM-3-26 and TLM-3-29) *for routing data to Customers via Closed IOnet and dedicated Customer circuits*.

3.2.5.1.1g The DAS shall support the Low Earth Orbiting – Terminal (LEO-T) SFDU ground transport header for return CCSDS telemetry formats for routing data to Customers via Closed IOnet and dedicated Customer circuits.

3.2.5.1.1g-01 The Archive/Server Subsystem shall support the Low Earth Orbiting – Terminal (LEO-T) SFDU ground transport header for return CCSDS telemetry formats for routing data to Customers via Closed IOnet and dedicated Customer circuits.

3.2.5.1.2 Deleted.

3.2.5.1.3 Archived Return Data Retrieval

Requirements

3.2.5.1.3.a The DAS shall respond to the retrieve archived return data request within 30 seconds.

3.2.5.1.3.a-01 The DASCON Subsystem shall respond to the retrieve archived return data request within 30 seconds, which includes issuing a command to the Archive/Server Subsystem within 15 seconds.

3.2.5.1.3.a-02 The Archive/Server Subsystem shall respond to the retrieve archived return data request within 15 seconds from the DASCON command.

3.2.5.1.3.b The DAS shall retrieve and transmit archived data within 1 minute of the specified time.

3.2.5.1.3.b-01 The DASCON Subsystem shall command the Archive/Server to retrieve and transmit archived data within 15 seconds of the specified 1-minute time interval.

3.2.5.1.3.b-02 The Archive/Server Subsystem shall retrieve and transmit archived data within 45 seconds from receipt of the DASCON command.

3.2.5.1.3.c The DAS shall reject archived data retrieval requests received within 1 minute of the request start time.

3.2.5.1.3.c-01 The DASCON Subsystem shall reject archived data retrieval requests received within 1 minute of the request start time.

3.2.5.1.4 Return Data Transmission

Requirements

3.2.5.1.4.a The DAS shall transmit return data, within the WSC DAS allocated aggregate bandwidth, to a maximum of 50 DAS Customers simultaneously.

3.2.5.1.4.a-01 The Archive/Server Subsystem shall transmit return data, within the WSC DAS allocated aggregate bandwidth, to a maximum of 50 DAS Customers simultaneously.

3.2.5.2 Return Data Archiving Management

3.2.5.2.1 Return Data Storage

Requirements

3.2.5.2.1.a The DAS shall provide no less than 100 Mbytes of storage space to archive return data.

3.2.5.2.1.a-01 The Archive/Server Subsystem shall provide no less than 100 Mbytes of storage space to archive return data.

3.2.5.2.1.b The DAS shall simultaneously manage archiving up to 50 return data streams.

3.2.5.2.1.b-01 The DASCON Subsystem shall simultaneously manage archiving up to 50 return data streams.

3.2.5.2.1.b-02 The Archive/Server Subsystem shall simultaneously manage archiving up to 50 return data streams.

3.2.5.2.1.c Archived data shall be overwritten on a first in, first out basis.

3.2.5.2.1.c-01 The Archive/Server shall overwrite archived data on a first in, first out basis.

3.2.5.2.1.d Notification shall be provided to the DAS LCM when the archived storage device is 90 percent full.

3.2.5.2.1.d-01 The Archive/Server Subsystem shall notify the DASCON GUI when the archived storage device is at least 90 percent full.

3.2.5.2.1.e The defined maximum allowed storage duration shall be changeable at the DAS LCM.

3.2.5.2.1.e-01 *The DASCON Subsystem shall be capable of changing the defined maximum allowed storage duration through the DASCON GUI.*

3.2.5.2.1.f The defined maximum storage capacity limit shall be changeable at the DAS LCM.

3.2.5.2.1.f-01 *The DASCON Subsystem shall be capable of changing the defined maximum storage capacity limit through the DASCON GUI.*

3.2.6 Local Control and Monitor

Requirements

3.2.6.a The DAS shall automatically provide status reports of all components that constitute DAS to the Local Control Monitor with a 5 second refresh rate.

3.2.6.a-01 *The DASCON Subsystem shall automatically provide status reports of all DAS components to the DASCON GUI with a 5 second refresh rate.*
3.2.6.a-02 *The ICON Subsystem shall automatically provide status reports of all components under ICON control to the ICON GUI with a 5 second refresh rate.*
3.2.6.a-03 *The DCON Subsystem shall automatically provide status reports of all components under DCON control to the DCON GUI with a 5 second refresh rate.*

3.2.7 Status

3.2.7.1 System Status

Requirement

3.2.7.1.a. DAS shall log status of all components that constitute DAS every 1 second.

3.2.7.1.a-01 *The DASCON Subsystem shall log status of all DAS components every 1 second.*
3.2.7.1.a-02 *The ICON Subsystem shall log status of all components under ICON control every 1 second.*
3.2.7.1.a-03 *The DCON Subsystem shall log status of all components under DCON control every 1 second.*

3.2.7.1.b. DAS shall time stamp all delogged status outputs.

3.2.7.1.b-01 *The DASCON Subsystem shall time stamp all delogged status outputs.*
3.2.7.1.b-02 *The ICON Subsystem shall time stamp all delogged status outputs.*
3.2.7.1.b-03 *The DCON Subsystem shall time stamp all delogged status outputs.*

3.2.7.1.c. DAS shall allow delogging of status based on data value changes only.

3.2.7.1.c-01 *The DASCON Subsystem shall allow delogging of status based on data value changes only.*
3.2.7.1.c-02 *The ICON Subsystem shall allow delogging of status based on data value changes only.*
3.2.7.1.c-03 *The DCON Subsystem shall allow delogging of status based on data value changes only.*

3.2.7.1.d. DAS shall log an event alert when an operational abnormality occurs within 1 second of the occurrence of the abnormality.

3.2.7.1.d-01 *The DASCON Subsystem shall log an event alert when an operational abnormality occurs within 1 second of the occurrence of the abnormality.*

3.2.7.1.d-02 *The ICON Subsystem shall log an event alert when an operational abnormality occurs within 1 second of the occurrence of the abnormality.*

3.2.7.1.d-03 *The DCON Subsystem shall log an event alert when an operational abnormality occurs within 1 second of the occurrence of the abnormality.*

3.2.7.1.e The DAS shall provide status of all components that constitute DAS on demand.

3.2.7.1.e-01 *The DASCON Subsystem shall provide status of all DAS components on demand.*

3.2.7.1.f The DAS shall provide DAS Customer performance status data to the LCM on demand.

3.2.7.1.f-01 *The DASCON Subsystem shall provide DAS Customer performance status data to the DASCON GUI on demand.*

3.2.7.1.f-02 *The ICON Subsystem shall provide DAS Customer performance status data to the ICON GUI on demand.*

3.2.7.1.f-03 *The DCON shall provide DAS Customer performance status data to the DCON GUI on demand.*

3.2.7.1.g The DAS shall allow delogging of individual status measurands.

3.2.7.1.g-01 *The DASCON Subsystem shall allow delogging of individual status measurands.*

3.2.7.1.g-02 *The ICON Subsystem shall allow delogging of individual status measurands.*

3.2.7.1.g-03 *The DCON Subsystem shall allow delogging of individual status measurands.*

3.2.7.1.h The DAS shall maintain system status log data for at least 45 days.

3.2.7.1.h-01 *The DASCON Subsystem shall maintain system status log data for at least 45 days.*

3.2.7.1.h-02 *The ICON Subsystem shall maintain system status log data for at least 45 days.*

3.2.7.1.h-03 *The DCON Subsystem shall maintain system status log data for at least 45 days.*

3.2.7.2 Customer Performance Status

Requirements

3.2.7.2.a The DAS shall provide performance status data to the DAS Customer at 1-minute intervals at the commencement of service

3.2.7.2.a-01 *The DASCON Subsystem shall provide performance status data to the DAS Customer through SWSI at 1-minute intervals at the commencement of service.*

3.2.7.2 Service Accounting Reporting

Requirements

3.2.7.3.a The service accounting statistics report shall be available at the LCM within 1 minute of the submitted request.

3.2.7.3.a-01 *The DASCON Subsystem shall provide service accounting statistics reports at the DASCON GUI within 1 minute of the submitted request.*

3.2.8 Deleted.

3.2.8.1 Deleted.

3.2.8.2 Deleted.

3.2.8.3 Deleted.

3.2.9 Deleted.

3.3 INTERFACE REQUIREMENTS

3.3.1 DAS-Customer Interfaces

Requirements

3.3.1.a The DAS shall interface with the SN Web Services Interface (SWSI) in accordance with the specifications in the Interface Control Document between the Demand Access System and the Space Network Web Services Interface, 451-ICD-DAS/SWSI.

3.3.1.a-01 *The DASCON Subsystem shall interface with the SN Web Services Interface (SWSI) in accordance with the specifications in the Interface Control Document between the Demand Access System and the Space Network Web Services Interface, 451-ICD-DAS/SWSI.*

3.3.2 Not Used

3.3.3 DAS-Customer Interfaces

Requirements

3.3.3.a The DAS shall exchange information with DAS Customers in accordance with the specifications in the Interface Control Document between the Demand Access System and the Demand Access System Customers, 451-ICD-DAS/Customer.

3.3.3.a-01 *The Archive/Server Subsystem shall exchange information with DAS Customers in accordance with the specifications in the Interface Control Document between the Demand Access System and the Demand Access System Customers, 451-ICD-DAS/Customer.*

3.3.3.b The DAS shall exchange information with DAS Customers in accordance with the specifications in the Interface Control Document between the Demand Access System and the Space Network Web Services Interface, 451-DAS/SWSI.

3.3.3.b-01 *The DASCON Subsystem shall exchange information with DAS Customers in accordance with the specifications in the Interface Control Document between the Demand Access System and the Space Network Web Services Interface, 451-DAS/SWSI.*

3.3.4 DAS-WSC System Interface

Requirements

3.3.4.a The DAS shall interface with the WSC Systems in accordance with the specifications in the Interface Control Document between the Demand Access System and the White Sands Complex, 451-ICD-DAS/WSC.

3.3.4.a-01 *The EMC Interface Subsystem shall interface with the WSC Systems in accordance with the specifications in the Interface Control Document between the Demand Access System and the White Sands Complex, 451-ICD-DAS/WSC.*

4 RELIABILITY, MAINTAINABILITY, AND AVAILABILITY REQUIREMENTS

This section specifies the reliability, maintainability, and availability (R/M/A) requirements for the DAS. Two categories of availability requirements are defined: inherent availability and operational availability.

4.1 RELIABILITY

The measure of reliability for the DAS is the mean time between failures (MTBF). The MTBF is defined as the 10-year life cycle of a fully operational DAS divided by the predicted number of failures.

4.1.1 Mean Time Between Failures (MTBF)

The MTBF is determined in accordance with MIL-HDBK-217, Reliability Prediction of Electronic Equipment.

Requirements:

4.1.1.a The Parts Count Reliability prediction method of MIL-HDBK-217 shall be used in the initial stages of system design.

4.1.1.a-01 *From the Parts Count Reliability prediction method, based on the results of the RELEX Reliability software program, the DAS subsystems shall meet or exceed the MTBF predicted values contained in Table 4-1.*

Table 4-1: Initial DAS MTBF Prediction Requirements Allocated to Subsystems

SUBSYSTEM	*Predicted MTBF (HR)*
Beamformer	*11,890*
Demodulator	*11,966*
EMC Interface	*9,503*
Frequency and Timing	*42,480*
IF Switch	*125,000*
ICON	*15,205*
DCON	*15,205*
DASCON	*13,934*
Archive/Server	*13,934*
Mechanical and Power	*435,000*

4.1.1.b The reliability prediction method shall shift to the Parts Stress Analysis Prediction method, or other reliability modeling technique approved by NASA, at the time when a firm, detailed parts list is available.

4.2 MAINTAINABILITY

Maintainability is characterized by the mean time to repair (MTTR) and includes the corrective maintenance time but not logistics and administrative delays inherent to the maintenance process. Logistics delays include the time required to provide replacement units at the failure location (replacement units are available at the WSC). Administrative delays include the time required for maintenance personnel and test equipment to arrive at the failure location.

4.2.1 Mean time to repair (MTTR)

Mean time to repair (MTTR) as the measure of maintainability is defined as the sum of corrective maintenance times at any specific level of repair, divided by the total number of failures within an item repaired at that level, during a particular interval under stated conditions. The MTTR includes the maintenance times for the first level maintenance as defined by Section 9.2.1.2. Time that is required for second level maintenance as defined in Section 9.2.1.3 is not a part of MTTR.

Requirements:

4.2.1.a A Maintainability Status Report shall be provided in accordance with Task 104 of MIL-HDBK-470a, Designing and Developing Maintainable Products and Systems, and include any changes in predicted maintainability parameters.

4.2.1.b The DAS shall have an MTTR not exceeding 30 minutes during the expected 10-year lifetime of the DAS.

The DAS at WSGT shall have an MTTR not exceeding 5 minutes during the expected 10-year lifetime of the DAS when considering operational redundancy and fault isolation.

The DAS at GRGT shall have an MTTR not exceeding 3 minutes during the expected 10-year lifetime of the DAS when considering operational redundancy and fault isolation.

4.2.1.c The maximum time to repair shall not exceed 1 hour for the 90th percentile of failures.

4.2.1.c-01 The EMC Interface Subsystem shall have a maximum time to repair that shall not exceed 1 hour for the 90th percentile of failures.

4.2.1.c-02 The Beamformer Subsystem shall have a maximum time to repair that shall not exceed 1 hour for the 90th percentile of failures.

4.2.1.c-03 The IF Switch Subsystem shall have a maximum time to repair that shall not exceed 1 hour for the 90th percentile of failures.

4.2.1.c-04 The Demodulator Subsystem shall have a maximum time to repair that shall not exceed 1 hour for the 90th percentile of failures.

4.2.1.c-05 The DASCON Subsystem shall have a maximum time to repair that shall not exceed 1 hour for the 90th percentile of failures.

4.2.1.c-06 The ICON Subsystem shall have a maximum time to repair that shall not exceed 1 hour for the 90th percentile of failures.

4.2.1.c-07 The DCON Interface Subsystem shall have a maximum time to repair that shall not exceed 1 hour for the 90th percentile of failures.

4.2.1.c-08 The Mechanical and Power Subsystem shall have a maximum time to repair that shall not exceed 1 hour for the 90th percentile of failures.

4.2.1.c-09 *The Frequency and Timing Subsystem shall have a maximum time to repair that shall not exceed 1 hour for the 90th percentile of failures.*

4.2.1.c-10 *The Archive/Server Subsystem shall have a maximum time to repair that shall not exceed 1 hour for the 90th percentile of failures.*

4.2.1.d These MTTRs shall be applicable to GRGT for components with locally available sparing.

4.2.2 Fault Isolation

To facilitate isolation of failures, a system of fault isolation will be provided which will meet the following requirements and constraints:

Requirements:

4.2.2.a Failures shall be isolated to one chassis or Line Replaceable Unit (LRU), whichever is smaller. Manual intervention can be used to isolate failures to below the chassis or LRU level.

4.2.2.a-01 *The EMC Interface Subsystem design shall provide a means for fault detection and isolation, to the LRU level for 97% of all failures within one (1) minute of occurrence of a fault.*

4.2.2.a-02 *The Beamformer Subsystem design shall provide a means for fault detection and isolation, to the LRU level for 97% of all failures within one (1) minute of occurrence of a fault.*

4.2.2.a-03 *The Demodulator Subsystem design shall provide a means for fault detection and isolation, to the LRU level for 97% of all failures within one (1) minute of occurrence of a fault.*

4.2.2.a-04 *The IF Switch Subsystem design shall provide a means for fault detection and isolation, to the LRU level for 97% of all failures within one (1) minute of occurrence of a fault.*

4.2.2.a-05 *The DASCON Subsystem design shall provide a means for fault detection and isolation, to the LRU level for 97% of all failures within one (1) minute of occurrence of a fault.*

4.2.2.a-06 *The ICON Subsystem design shall provide a means for fault detection and isolation, to the LRU level for 97% of all failures within one (1) minute of occurrence of a fault.*

4.2.2.a-07 *The DCON Subsystem design shall provide a means for fault detection and isolation, to the LRU level for 97% of all failures within one (1) minute of occurrence of a fault.*

4.2.2.a-08 *The Archive/Server Subsystem design shall provide a means for fault detection and isolation, to the LRU level for 97% of all failures within one (1) minute of occurrence of a fault.*

4.2.2.b Modes shall be provided to enable the repeating and/or bypassing of tests to check the operation of the subsystems while using internal or external test equipment.

4.2.2.b-01 *The EMC Interface Subsystem shall provide modes to enable the repeating and/or bypassing of tests to check the operation of the subsystems while using internal or external test equipment.*

4.2.2.b-02 *The Beamformer Subsystem shall provide modes to enable the repeating and/or bypassing of tests to check the operation of the subsystems while using internal or external test equipment.*

4.2.2.b-03 *The IF Switch Subsystem shall provide modes to enable the repeating and/or bypassing of tests to check the operation of the subsystems while using internal or external test equipment.*

4.2.2.b-04 *The Demodulator Subsystem shall provide modes to enable the repeating and/or bypassing of tests to check the operation of the subsystems while using internal or external test equipment.*

4.2.2.b-05 *The DASCON Subsystem shall provide modes to enable the repeating and/or bypassing of tests to check the operation of the subsystems while using internal or external test equipment.*

4.2.2.b-06 *The ICON Subsystem shall provide modes to enable the repeating and/or bypassing of tests to check the operation of the subsystems while using internal or external test equipment.*

4.2.2.b-07 *The DCON Subsystem shall provide modes to enable the repeating and/or bypassing of tests to check the operation of the subsystems while using internal or external test equipment.*

4.2.2.b-08 *The Frequency and Timing Subsystem shall provide modes to enable the repeating and/or bypassing of tests to check the operation of the subsystems while using internal or external test equipment.*

4.3 INHERENT AVAILABILITY (A_I)

Inherent availability (A_i) is the probability that a system or equipment, when used under stated conditions in an ideal support environment (i.e., using available tools, spares, and personnel) will operate within specifications at all times. It excludes preventive maintenance actions, logistics supply time, and administrative downtime and is defined as

$A_i = MTBF/(MTBF + MTTR)$

where MTBF = mean time between failures and MTTR = mean time to repair.

Requirements:

4.3.a The inherent availability for any period of 10,000 hours shall be 0.995. *RMA Prediction report shows inherent availability of 0.995 is met.*

4.4 OPERATIONAL AVAILABILITY (A_O)

The operational availability (A_o) of the DAS is defined in terms of each multiple access Customer service.

Requirements:

4.4.a For each DAS there shall be a communications path from the output of the EMC to the Data routing and Archiving external interface, such that the operational availability, measured over a 10,000 hour interval is 0.9999. Redundant paths may be used in achieving this Ao. *RMA Prediction report shows an Operational Availability of 0.9999 for WSGT and 0.9998 for GRGT.*

4.4.1 Operational Availability Computation

The computation of operational availability for DAS is defined as:

$$A_O = \frac{\text{Time Service is Available}}{\text{Time Service is Available + Time Service is Not Available}}$$

Requirements:

4.4.1.a Available service time is measured over a contiguous 10,000 hour interval except that any loss of availability due to loss of facility services such as power or air conditioning, or loss of system capability resulting from unusual weather conditions, such as icing or severe rain storms, shall not be counted.

4.4.1.b The time service is not available shall include all times service is not available due to corrective maintenance downtime, administrative downtime, logistics supply downtime, and preventive maintenance downtime.

5 EQUIPMENT DESIGN AND CONSTRUCTION

This section specifies the general electrical and mechanical design and construction requirements for the chassis, subsystems and racks comprised by the DAS.

5.1 GENERAL REQUIREMENTS FOR ELECTRONIC EQUIPMENT

5.1.1 Equipment of New Design or Significantly Modified Design

Requirements:

5.1.1.a All chassis, subsystems and systems of new design or significantly modified design shall be designed and constructed to comply with the requirements of STDN-SPEC-4, GSFC General Requirements for STDN Electronic Equipment, or best commercial practices.

- Note 1: Deviation Requested: Painting and plating methods changed to comply with EPA requirements.
- Note 2: Deviation requested; Rack design does not provide adequate number of power outlets.

5.1.1.a-01 *EMC Interface Subsystem shall be designed and constructed to comply with the requirements of STDN-SPEC-4, GSFC General Requirements for STDN Electronic Equipment, or best commercial practices.*

5.1.1.a-02 *Beamformer Subsystem shall be designed and constructed to comply with the requirements of STDN-SPEC-4, GSFC General Requirements for STDN Electronic Equipment, or best commercial practices.*

5.1.1.a-03 *IF Switch Subsystem shall be designed and constructed to comply with the requirements of STDN-SPEC-4, GSFC General Requirements for STDN Electronic Equipment, or best commercial practices.*

5.1.1.a-04 *DASCON Subsystem shall be designed and constructed to comply with the requirements of STDN-SPEC-4, GSFC General Requirements for STDN Electronic Equipment, or best commercial practices.*

5.1.1.a-05 *ICON Subsystem shall be designed and constructed to comply with the requirements of STDN-SPEC-4, GSFC General Requirements for STDN Electronic Equipment, or best commercial practices.*

5.1.1.a-06 *DCON Subsystem shall be designed and constructed to comply with the requirements of STDN-SPEC-4, GSFC General Requirements for STDN Electronic Equipment, or best commercial practices.*

5.1.1.a-07 *Mechanical and Power Subsystem shall be designed and constructed to comply with the requirements of STDN-SPEC-4, GSFC General Requirements for STDN Electronic Equipment, or best commercial practices.*

5.1.1.a-08 *Timing and Frequency Subsystem shall be designed and constructed to comply with the requirements of STDN-SPEC-4, GSFC General Requirements for STDN Electronic Equipment, or best commercial practices.*

5.1.1.a-09 *Archive/Server Subsystem shall be designed and constructed to comply with the requirements of STDN-SPEC-4, GSFC General Requirements for STDN Electronic Equipment, or best commercial practices.*

5.1.1.a-10 *Demodulator Subsystem shall be designed and constructed to comply with the requirements of STDN-SPEC-4, GSFC General Requirements for STDN Electronic Equipment, or best commercial practices.*

5.1.1.b Section 3.16 of STDN-SPEC-4, Maintainability shall not apply.

5.1.1.c Maintainability provisions of this specification shall be used.

5.1.1.d Programmable semiconductor devices in any chassis shall be handled in accordance with the provisions of STDN-SPEC-3, Specification Programming and Handling Semiconductor Devices.

5.1.1.e Connectors, cable, wires and other materials listed in STDN-SPEC-8, GSFC Specification for Electronic Equipment Installation Materials shall be used in the design and construction of WSC equipment. Use of materials other than those in STDN-SPEC-8 will require a waiver from the DAS Product Design Lead.

5.2 ELECTRONIC EQUIPMENT RACKS

Requirements:

5.2.a DAS equipment shall be mounted in electronic equipment racks, which conform to STDN No. 270.5, GSFC Specification Electronic Equipment Racks.

- Note: Deviation requested; Existing rack design does not provide adequate number of power outlets.

5.2.a-01 *EMC Interface Subsystem equipment shall be mounted in electronic equipment racks, which conform to STDN No. 270.5, GSFC Specification Electronic Equipment Racks.*

5.2.a-02 *Beamformer Subsystem equipment shall be mounted in electronic equipment racks, which conform to STDN No. 270.5, GSFC Specification Electronic Equipment Racks.*

5.2.a-03 *IF Switch Subsystem equipment shall be mounted in electronic equipment racks, which conform to STDN No. 270.5, GSFC Specification Electronic Equipment Racks.*

5.2.a-04 *Timing and Frequency Subsystem equipment shall be mounted in electronic equipment racks, which conform to STDN No. 270.5, GSFC Specification Electronic Equipment Racks.*

5.2.a-05 *Mechanical and Power Subsystem equipment shall be mounted in electronic equipment racks, which conform to STDN No. 270.5, GSFC Specification Electronic Equipment Racks.*

5.2.a-06 *DASCON Subsystem equipment shall be mounted in electronic equipment racks, which conform to STDN No. 270.5, GSFC Specification Electronic Equipment Racks.*

5.2.a-07 *ICON Subsystem equipment shall be mounted in electronic equipment racks, which conform to STDN No. 270.5, GSFC Specification Electronic Equipment Racks.*

5.2.a-08 *DCON Subsystem equipment shall be mounted in electronic equipment racks, which conform to STDN No. 270.5, GSFC Specification Electronic Equipment Racks.*

5.2.a-09 *Archive/Server Subsystem equipment shall be mounted in electronic equipment racks, which conform to STDN No. 270.5, GSFC Specification Electronic Equipment Racks.*

5.2.a-10 *Demodulator Subsystem equipment shall be mounted in electronic equipment racks, which conform to STDN No. 270.5, GSFC Specification Electronic Equipment Racks.*

5.2.b Tapped panel mounting holes shall be included (Section 6.8 of STDN No. 270.5).

5.2.c If required to meet the Electromagnetic Interference (EMI) requirements for the WSC, the Electromagnetic Compatibility option (Section 6.10 of STDN No. 270.5) shall be used where necessary.

5.2.d If racks in excess of the standard 19-inch panel width are required for mounting some equipment, Section 6.14 of STDN No. 270.5 shall apply.

- Note: Deviations requested: Two components – DASCON computer and Archive/Server exceed rack depths.

5.2.e Equipment consoles shall comply with the requirements of Section 6.18 of STDN No. 270.5. If size constraints of standard equipment require console construction that differs from the requirements of Section 6.17, or if the contractor desires to use consoles, which are not in compliance with Section 6.17 of STDN No. 270.5, then a waiver will be required from the DAS Product Design Lead.

5.2.e-01 EMC Interface Subsystem equipment consoles shall comply with the requirements of Section 6.18 of STDN No. 270.5 or a waiver from the DAS Product Design Lead will be required as stated in SRD 5.2.e.

5.2.e-02 Beamformer Subsystem equipment consoles shall comply with the requirements of Section 6.18 of STDN No. 270.5 or a waiver from the DAS Product Design Lead will be required as stated in SRD 5.2.e.

5.2.e-03 IF Switch Subsystem equipment consoles shall comply with the requirements of Section 6.18 of STDN No. 270.5 or a waiver from the DAS Product Design Lead will be required as stated in SRD 5.2.e.

5.2.e-04 DASCON Subsystem equipment consoles shall comply with the requirements of Section 6.18 of STDN No. 270.5 or a waiver from the DAS Product Design Lead will be required as stated in SRD 5.2.e.

5.2.e-05 ICON Subsystem equipment consoles shall comply with the requirements of Section 6.18 of STDN No. 270.5 or a waiver from the DAS Product Design Lead will be required as stated in SRD 5.2.e.

5.2.e-06 DCON Subsystem equipment consoles shall comply with the requirements of Section 6.18 of STDN No. 270.5 or a waiver from the DAS Product Design Lead will be required as stated in SRD 5.2.e.

5.2.e-07 Archive/Server Subsystem equipment consoles shall comply with the requirements of Section 6.18 of STDN No. 270.5 or a waiver from the DAS Product Design Lead will be required as stated in SRD 5.2.e.

5.2.e-08 Mechanical and Power Subsystem equipment consoles shall comply with the requirements of Section 6.18 of STDN No. 270.5 or a waiver from the DAS Product Design Lead will be required as stated in SRD 5.2.e.

5.2.e-09 Timing and Frequency Subsystem equipment consoles shall comply with the requirements of Section 6.18 of STDN No. 270.5 or a waiver from the DAS Product Design Lead will be required as stated in SRD 5.2.e.

5.2.e-10 Demodulator Subsystem equipment consoles shall comply with the requirements of Section 6.18 of STDN No. 270.5 or a waiver from the DAS Product Design Lead will be required as stated in SRD 5.2.e.

5.3 CABLING AND CONNECTORS

The following provisions of Section 5.3 apply to all DAS Subsystems.

Requirements:

5.3.a Each rack shall be provided with an input/output (bulkhead) panel in accordance with Section 3.7a of STDN-SPEC-4.

5.3.b All cabling between DAS delivered systems and subsystems and WSC Systems shall be provided.

5.3.c All mating connectors shall be supplied.

5.3.d All cabling required to configure the systems and subsystems for checkout and in-plant testing shall be provided. This includes cabling required at the WSGT/STGT and GRGT sites for all special test equipment.

5.4 ELECTROMAGNETIC INTERFERENCE (EMI)

Requirements:

5.4.a Deleted

5.4.b Deleted

5.4.c The operational convenience of the DAS shall be maintained while satisfying the above requirements by the exclusion of rack front doors, hidden controls and displays, and by the location of equipment in the system racks.

5.4.c-01 *The operational convenience of the EMC Interface subsystem shall be maintained while satisfying the above requirements by the exclusion of rack front doors, hidden controls and displays, and by the location of equipment in the system racks.*

5.4.c-02 *The operational convenience of the Beamformer subsystem shall be maintained while satisfying the above requirements by the exclusion of rack front doors, hidden controls and displays, and by the location of equipment in the system racks.*

5.4.c-03 *The operational convenience of the ICON Subsystem shall be maintained while satisfying the above requirements by the exclusion of rack front doors, hidden controls and displays, and by the location of equipment in the system racks.*

5.4.c-04 *The operational convenience of the IF Switch Subsystem shall be maintained while satisfying the above requirements by the exclusion of rack front doors, hidden controls and displays, and by the location of equipment in the system racks.*

5.4.c-05 *The operational convenience of the DASCON Subsystem shall be maintained while satisfying the above requirements by the exclusion of rack front doors, hidden controls and displays, and by the location of equipment in the system racks.*

5.4.c-06 *The operational convenience of the DCON Subsystem shall be maintained while satisfying the above requirements by the exclusion of rack front doors, hidden controls and displays, and by the location of equipment in the system racks.*

5.4.c-07 *The operational convenience of the Frequency and Timing Subsystem shall be maintained while satisfying the above requirements by the exclusion of rack front doors, hidden controls and displays, and by the location of equipment in the system racks.*

5.4.c-08 *The operational convenience of the Mechanical and Power Subsystem shall be maintained while satisfying the above requirements by the exclusion of rack front doors, hidden controls and displays, and by the location of equipment in the system racks.*

5.4.c-09 *The operational convenience of the Archive/Server Subsystem shall be maintained while satisfying the above requirements by the exclusion of rack front doors, hidden controls and displays, and by the location of equipment in the system racks.*

5.4.c-10 *The operational convenience of the Demodulator subsystem shall be maintained while satisfying the above requirements by the exclusion of rack front doors, hidden controls and displays, and by the location of equipment in the system racks.*

5.4.d EMI racks and filtering shall be used as required.

5.4.d-01 *The Mechanical and Power Subsystem shall use EMI racks and filtering as required.*

5.4.e All controls and displays shall be fully accessible during setup and normal operation of the DAS.

5.4.e-01 *EMC Interface Subsystem controls and displays shall be fully accessible during setup and normal operation of the DAS.*

5.4.e-02 *Beamformer Subsystem controls and displays shall be fully accessible during setup and normal operation of the DAS.*

5.4.e-03 *IF Switch Subsystem controls and displays shall be fully accessible during setup and normal operation of the DAS.*

5.4.e-04 *DASCON Subsystem controls and displays shall be fully accessible during setup and normal operation of the DAS.*

5.4.e-05 *ICON Subsystem controls and displays shall be fully accessible during setup and normal operation of the DAS.*

5.4.e-06 *DCON Subsystem controls and displays shall be fully accessible during setup and normal operation of the DAS.*

5.4.e-07 *Mechanical and Power Subsystem controls and displays shall be fully accessible during setup and normal operation of the DAS.*

5.4.e-08 *Timing and Frequency Subsystem controls and displays shall be fully accessible during setup and normal operation of the DAS.*

5.4.e-09 *Archive/Server Subsystem controls and displays shall be fully accessible during setup and normal operation of the DAS.*

5.4.e-10 *Demodulator Subsystem controls and displays shall be fully accessible during setup and normal operation of the DAS.*

5.4.f DAS equipment shall not be affected by conducted or radiated emissions resulting from the operation of existing equipment.

5.4.f-01 *EMC Interface Subsystem equipment shall not be affected by conducted or radiated emissions resulting from the operation of existing equipment.*

5.4.f-02 *Beamformer Subsystem equipment shall not be affected by conducted or radiated emissions resulting from the operation of existing equipment.*

5.4.f-03 *IF Switch Subsystem equipment shall not be affected by conducted or radiated emissions resulting from the operation of existing equipment.*

5.4.f-04 *DASCON Subsystem equipment shall not be affected by conducted or radiated emissions resulting from the operation of existing equipment.*

5.4.f-05 *ICON Subsystem equipment shall not be affected by conducted or radiated emissions resulting from the operation of existing equipment.*

5.4.f-06 *DCON Subsystem equipment shall not be affected by conducted or radiated emissions resulting from the operation of existing equipment.*

5.4.f-07 *Mechanical and Power Subsystem equipment shall not be affected by conducted or radiated emissions resulting from the operation of existing equipment.*

5.4.f-08 *Timing and Frequency Subsystem equipment shall not be affected by conducted or radiated emissions resulting from the operation of existing equipment.*

5.4.f-09 *Archive/Server Subsystem equipment shall not be affected by conducted or radiated emissions resulting from the operation of existing equipment.*

5.4.f-10 *Demodulator Subsystem equipment shall not be affected by conducted or radiated emissions resulting from the operation of existing equipment.*

5.4.g All DAS equipment shall comply with STGT-HE-04-04, USS RF Equipment Group HWCI Specification (HWCI No.4) Section 3.3.4.2 for Electromagnetic Compatibility (EMC) Control.

5.4.g-01 *EMC Interface Subsystem equipment shall comply with STGT-HE-04-04, USS RF Equipment Group HWCI Specification (HWCI No.4) Section 3.3.4.2 for Electromagnetic Compatibility (EMC) Control.*

5.4.g-02 *Beamformer Subsystem equipment shall comply with STGT-HE-04-04, USS RF Equipment Group HWCI Specification (HWCI No.4) Section 3.3.4.2 for Electromagnetic Compatibility (EMC) Control.*

5.4.g-03 *IF Switch Subsystem equipment shall comply with STGT-HE-04-04, USS RF Equipment Group HWCI Specification (HWCI No.4) Section 3.3.4.2 for Electromagnetic Compatibility (EMC) Control.*

5.4.g-04 *DASCON Subsystem equipment shall comply with STGT-HE-04-04, USS RF Equipment Group HWCI Specification (HWCI No.4) Section 3.3.4.2 for Electromagnetic Compatibility (EMC) Control.*

5.4.g-05 *ICON Subsystem equipment shall comply with STGT-HE-04-04, USS RF Equipment Group HWCI Specification (HWCI No.4) Section 3.3.4.2 for Electromagnetic Compatibility (EMC) Control.*

5.4.g-06 *DCON Subsystem equipment shall comply with STGT-HE-04-04, USS RF Equipment Group HWCI Specification (HWCI No.4) Section 3.3.4.2 for Electromagnetic Compatibility (EMC) Control.*

5.4.g-07 *Mechanical and Power Subsystem equipment shall comply with STGT-HE-04-04, USS RF Equipment Group HWCI Specification (HWCI No.4) Section 3.3.4.2 for Electromagnetic Compatibility (EMC) Control.*

5.4.g-08 *Frequency and Timing Subsystem equipment shall comply with STGT-HE-04-04, USS RF Equipment Group HWCI Specification (HWCI No.4) Section 3.3.4.2 for Electromagnetic Compatibility (EMC) Control.*

5.4.g-09 *Archive/Server Subsystem equipment shall comply with STGT-HE-04-04, USS RF Equipment Group HWCI Specification (HWCI No.4) Section 3.3.4.2 for Electromagnetic Compatibility (EMC) Control.*

5.4.g-10 *Demodulator Subsystem equipment shall comply with STGT-HE-04-04, USS RF Equipment Group HWCI Specification (HWCI No.4) Section 3.3.4.2 for Electromagnetic Compatibility (EMC) Control.*

5.4.h DAS equipment conducted or radiated emissions shall not affect existing equipment.

5.4.h-01 *EMC Interface Subsystem equipment conducted or radiated emissions shall not affect existing equipment.*

5.4.h-02 *Beamformer Subsystem equipment conducted or radiated emissions shall not affect existing equipment.*

5.4.h-03 *IF Switch Subsystem equipment conducted or radiated emissions shall not affect existing equipment.*

5.4.h-04 *DASCON Subsystem equipment conducted or radiated emissions shall not affect existing equipment.*

5.4.h-05 *ICON Subsystem equipment conducted or radiated emissions shall not affect existing equipment.*

5.4.h-06 *DCON Subsystem equipment conducted or radiated emissions shall not affect existing equipment.*

5.4.h-07 *Mechanical and Power Subsystem equipment conducted or radiated emissions shall not affect existing equipment.*

5.4.h-08 *Frequency and Timing Subsystem equipment conducted or radiated emissions shall not affect existing equipment.*

5.4.h-09 *Archive/Server Subsystem equipment conducted or radiated emissions shall not affect existing equipment.*

5.4.h-10 *Demodulator Subsystem equipment conducted or radiated emissions shall not affect existing equipment.*

6 INSTALLATION REQUIREMENTS

This section specifies the requirements for the installation of the DAS equipment. The approach, methods, equipment, and schedules for planning, managing, performing, and monitoring the installation of the DAS equipment is specified.

6.1 INSTALLATION

6.1.1 Site Planning

Requirements:

6.1.1.a WSC-provided site documents shall be used in planning the configuration and layout of equipment.

6.1.1.b A set of plans shall be developed that provides an efficient layout of all equipment.

6.1.1.c The site plan shall provide drawings that specify the type, size, length, number, and layout of conductors for all signal and power cabling necessary for equipment operation.

6.1.1.d The site plan shall contain, for each major component: the BTUs emitted; the electrical power requirements by KVA, Hertz, Volts and power conditioning; and the floor space area occupied by each rack or multiple rack system.

6.1.1.e The equipment installation shall be documented in accordance with the requirements of the WSC Handbook Series, Volume VII, Engineering, 530-WSC-LOP-VII and, the Specification Station Handbook Documentation, STDN-SPEC-10.

6.2 SITE PREPARATION

The following services, which are required to prepare the sites for the installation and testing of the DAS, will be provided.

Requirements:

6.2.a All power and signal cables necessary for equipment operations shall be provided.

6.2.b Cable installation shall be in accordance with the requirements of STDN-SPEC-6, GSFC Specification Installation Requirements for STDN Equipment.

6.2.c All cable fabrication shall be in accordance with the requirements of STDN-SPEC-4, Section 3.7.

6.3 EQUIPMENT INSTALLATIONS

Requirements:

6.3.a Equipment installations shall be in accordance with STDN-SPEC-6, Installation Requirements for STDN Equipment

6.3.b Floor panels shall be in accordance with the requirements of STDN-SPEC-6.

7 DOCUMENTATION

7.1 DOCUMENTATION

Requirements:

All documentation is to be developed in accordance with the Data Requirements List (DRL) and Data Item Descriptions (DIDs). The DRL lists each document to be provided and the DIDs describe the purpose, content and format of each document.

8 TRAINING

8.1 GENERAL

This section specifies the objectives and approach for the training of WSC personnel.

Requirements:

8.1.a Training policies, plans and procedures shall provide for orderly transition into sustained operation and maintenance.

8.2 OBJECTIVES AND APPROACH

Requirements:

8.2.a Training shall prepare operations and maintenance personnel, including both Government and contractor employees, to operate, maintain, and support the DAS.

8.2.b Operations personnel shall be trained to perform operations functions in accordance with WSC Local Operations Procedures (LOPs) .

8.2.c Maintenance technicians shall be trained to maintain DAS subsystems in order to meet the maintainability requirements. This includes training in the maintenance of software and firmware using the facilities provided in the SMTF. The overall training objective is to provide certified and maintenance personnel.

8.2.d The maximum amount of training shall be performed at the WSC. Training shall be conducted at other sites, such as vendor facilities, when it is cost effective to the Government, e.g., to take advantage of existing courses and training facilities.

8.2.e The course material shall be modularized, individualized, and use multimedia learning resources including manuals, study guides, workbooks and audiovisual materials as appropriate.

8.2.f The initial training program shall concentrate on maintenance and operations.

8.2.g Students for further training programs shall include NASA instructors, cognizant NASA technical personnel, NASA system engineers and WSC Operations and Maintenance (O&M) contractor personnel. The major portion of this training will be conducted during the installation phase of the DAS.

8.3 TRAINING PROGRAM

Requirements:

8.3.a The training program shall include a definition of the qualifications required by operations and maintenance personnel to meet position description skill requirements.

8.3.b A training plan to define the phasing, methods and techniques for achieving the requisite skill levels, using curricula and course materials for skill/qualification areas within each position description shall be included.

8.3.c Training devices and equipment shall be included.

8.3.d Administrative support to implement the training program shall be included.

8.4 SKILL AREA REQUIREMENTS

8.4.1 Operator Training

Requirements:

8.4.1.a Operator training shall cover a DAS network overview.

8.4.1.b Operator training shall cover the DAS concept of operations including key design features.

8.4.1.c Operator training shall cover detailed DAS operational procedures.

8.4.2 Maintenance Technician Training

Requirements:

8.4.2.a Maintenance training for both hardware and software shall cover DAS maintenance concept.

8.4.2.b Maintenance training for both hardware and software shall cover diagnostics and troubleshooting.

8.4.2.c Maintenance training for both hardware and software shall cover detailed repair procedures and techniques including the use of available tools and repair equipment.

8.4.2.d Maintenance training for both hardware and software shall cover DAS software maintenance concepts.

8.4.2.e Software-unique maintenance training shall include debugging techniques and high order language (HOL) use.

8.4.2.f Training shall cover maintenance of both operational and support software.

8.5 TRAINING DEVICES AND EQUIPMENT

To the maximum extent practicable, hardware maintenance training should take advantage of equipment, and simulation/automation capabilities provided for day-to-day WSC operations.

Requirements:

8.5.a DAS training devices and equipment for maintenance training shall be specified in the Training Plan.

8.6 TRAINING SUPPORT

Requirements:

8.6.a Administrative support for training shall provide for the testing and certification of students.

9 MAINTENANCE REQUIREMENTS

9.1 OVERVIEW

This section contains the detailed maintenance requirements for the WSC. The objective of the maintenance functions is to support achievement of the required inherent availability. General requirements, which directly affect the performance of maintenance functions, include ease of access to equipment for tests and maintenance, the use of built-in test and diagnostic features, and the capability to perform maintenance without interfering with on-going operations.

9.2 DETAILED MAINTENANCE REQUIREMENTS

The WSC has the resources, personnel, and logistics support required to (1) maintain, modify, and repair hardware and (2) maintain modify and enhance software. Hardware maintenance is performed under a formally established system maintenance program that includes both Preventive Maintenance and Corrective Maintenance procedures.

Requirements:

9.2.a Procedures shall be developed using 500-tip-2111, Content Specification for Operation and Maintenance Manuals, as a guideline.

9.2.b Any state-of-the-art techniques that are developed for the DAS shall be included in the procedures.

9.2.1 Hardware Maintenance

Hardware maintenance will be conducted at two levels. First level maintenance is conducted to support the inherent availability requirements by replacement of line replaceable units (LRUs) and line replaceable items within LRUs. Second level maintenance consists of the repair, adjustment, and testing of LRUs removed from service during first level maintenance actions. Attention will be given to GSFC specifications so as to provide for chassis slides, cable service loops, and cable retractors to aid maintenance.

9.2.1.1 Identification of LRU

Requirements:

9.2.1.1.a LRUs shall include rack-mounted equipment drawers and panels and other assemblies that can be removed by unplugging power and signal connectors without physically disturbing other LRUs. Other line replaceable items include printed circuit cards and other plug-in components within an LRU.

9.2.1.2 First Level Maintenance

Requirements:

9.2.1.2.a First level maintenance shall include scheduled preventive maintenance.

9.2.1.2.b First level maintenance shall include fault isolating to the level of an LRU.

9.2.1.2.c Fault isolation to the level of a line replaceable item within an LRU (if any) shall be performed if the time required is consistent with the operational maintainability requirement

9.2.1.2.d First level maintenance shall include replacement of a failed LRU or line replaceable element within an LRU.

9.2.1.2.e First level maintenance shall include testing to ensure that the system/subsystem has been restored to operational condition.

9.2.1.2.f First level maintenance shall include alignment and tuning.

9.2.1.3 Second Level Maintenance

Second level maintenance is conducted to restore malfunctioning equipment to serviceable condition when the failure requires unit/element disassembly. Second level maintenance is also required when the fault isolation capabilities of first level maintenance are incapable of localizing a failure to a line replaceable item within an LRU. Second level maintenance is performed in or under the management control of the Hardware Maintenance Depot.

Requirements:

9.2.1.3.a Second level maintenance actions shall include localization of a failure to the piece-part or equipment component level, as appropriate.

9.2.1.3.b Second level maintenance actions shall include disassembly and removal of the failed piece-part or equipment component.

9.2.1.3.c Second level maintenance actions shall include replacement of failed elements and reassembly.

9.2.1.3.d Second level maintenance actions shall include bench testing to ensure performance to the specified level.

9.2.2 Software Maintenance

Software maintenance, including debugging, modification, and enhancement of system software packages, shall be performed in the SMTF.

10 SPARES PROVISIONING

10.1 OVERVIEW

Requirements for spares provisioning are presented for each of the following time periods:

Prior to Acceptance Testing.
After Acceptance Testing.

Requirements:

10.1.a Spares provisioning for the WSC shall be determined and provided by the development contractor through Provisional Acceptance Testing.

10.1.b A series of provisioning conferences shall be supported to develop the spares provisioning program in accordance with STDN 507, Network Logistics Manual.

10.1.c All support spares remaining after Acceptance testing shall be delivered to the WSC site. Prior to Acceptance Testing, the WSC O&M contractor and Logistics Support Depot contractor, under the direction of NASA, will implement the spares provisioning program, replenish the spares to the proper levels, and provide follow-on spares to support the DAS. After Acceptance Testing of the DAS, the WSC O&M contractor will maintain the spares support program primarily through requisitioning from the Logistics Support Depot (LSD). Spare parts provisioning procedures will be coordinated with the Logistics Support Depot contractor (currently responsible for Network provisioning) and the WSC O&M contractor, under the overall direction of NASA. After Acceptance Testing, follow-on provisioning spares will be arranged by the Logistics Support Depot contractor.

10.1.d The information required to develop, implement and maintain operation of this spares provisioning program consistent with the DAS requirements contained in this Specification and the spares provisioning requirements identified in the following sections, shall be provided.

10.2 PROVISIONING CONFERENCES

Requirements:

The provisioning conference will be held in the Critical Design Review timeframe. NASA, supported by the WSC O&M contractor and the Logistics Support Depot contractor, will make purchase and stocking decisions based upon the availability and maintainability requirements and demand history/logistics support analysis results.

10.3 INITIAL SPARES PROVISIONING

Requirements:

10.3.a The initial spares provisioning shall be determined. A spares provisioning formula will not be provided by NASA.

10.3.b The proposed spare parts and quantities shall be based upon satisfying the availability and maintainability requirements of this Specification.

10.4 REPLENISHMENT SPARES

Replenishment spare parts for the WSC will be procured by NASA supported by the WSC O&M and Logistics Support Depot contractors.

Requirements:

10.4.a Technical data shall be provided to allow for procurement of spare parts directly from the actual manufacturer of the equipment.

10.4.1 Spare Parts Availability

Requirements:

10.4.1.a It shall be ensured that either spare parts are available for a period of 10 years after Final Acceptance Testing or that NASA be provided advance notice of intent to discontinue manufacture of parts/components by all levels of subcontractors.

11 SECURITY

11.1 OVERVIEW

The DAS will be installed within the WSC and interconnect with Customers via the SN Web Services Interface (SWSI) and the NASA Integrated Services Network (NISN) Closed Internet Protocol (IP) Operational Network (IOnet) for control and status. The DAS will interconnect with Closed IOnet or dedicated Customer circuits for telemetry delivery.

Requirements:

11.1.a. The DAS shall conform to the requirements and procedures of NASA NPG 2810.1, Security of Information Technology for Mission Information.

11.2 SECURITY BOUNDARY

NPG 2810.1, paragraph 4.2.5.a, establishes the criteria for defining an IT system Security Boundary.

Requirements:

11.2.a. The DAS IT Security Boundary for Customer control and status shall be at the interface to the SWSI. SWSI security implementation is documented in 542-SP-SWSI, Security Plan for SWSI.

11.2.a.- 01 The DASCON Subsystem IT Security Boundary for Customer control and status shall be at the interface to the SWSI. SWSI security implementation is documented in 542-SP-SWSI, Security Plan for SWSI.

11.2.b. The DAS IT Security Boundary for NISN Closed IOnet telemetry delivery shall be at the WSC Closed IOnet interface. NISN Closed IOnet security implementation is documented in MOD 290-003, IP Operational Network (IOnet) Security Plan.

11.2.b.- 01 The DASCON Subsystem IT Security Boundary for NISN Closed IOnet telemetry delivery shall be at the WSC Closed IOnet interface. NISN Closed IOnet security implementation is documented in MOD 290-003, IP Operational Network (IOnet) Security Plan.

11.2.c. The DAS IT Security Boundary for Internet telemetry delivery shall be at the interface with the NISN Secure Gateway defined in MOD 290-003 IP Operational Network (IOnet) Security Plan.

11.2.c.- 01 The Archive/Server Subsystem IT Security Boundary for Internet telemetry delivery shall be at the interface with the NISN Secure Gateway defined in MOD 290-003 IP Operational Network (IOnet) Security Plan.

11.2.d. The DAS Physical Security Boundary shall be within the Category II Limited Areas defined in MO&DSD 530-WSC-0009 WSC Security Manual.

11.3 DAS INTERCONNECTION

Requirements:

11.3.a. The DAS connection to the SWSI interface shall be via the Closed IOnet only.

11.3.a.- 01 The DASCON Subsystem connection to the SWSI interface shall be via the Closed IOnet only.

11.3.b. The DAS connection to the NISN Secure Gateway shall be via the Closed IOnet only.

11.3.b.- 01 The Archive/Server Subsystem connection to the NISN Secure Gateway shall be via the Closed IOnet only.

11.4 ACCESS TO DAS DATA

11.4.a. The DAS shall ensure that only specifically authorized Customers have access to their specific Customer data.

11.4.a.- 01 The SWSI System shall ensure that only specifically authorized Customers have access to their specific Customer data as provided by SWSI as part of DAS security procedures.

11.4.b. The DAS shall control access to DAS data by O&M personnel as defined in MO&DSD 530-WSC-0024 Information Technology Systems Security Plan (ITSSP) for the White Sands Complex.

11.4.b.- 01 The DASCON Subsystem shall control access to DAS data by O&M personnel via the DASCON GUI as defined in MO&DSD 530-WSC-0024 Information Technology Systems Security Plan (ITSSP) for the White Sands Complex.

12 HUMAN ENGINEERING AND SAFETY

12.1 HUMAN ENGINEERING

12.1.a Equipment mountings, fasteners and labeling shall conform to the human engineering requirements in MIL-STD-1472C.

12.1.a-01 The EMC Interface Subsystem Equipment mountings, fasteners, and labeling shall conform to the human engineering requirements specified in MIL–STD–1472C.

12.1.a-02 Beamformer Subsystem Equipment mountings, fasteners, and labeling shall conform to the human engineering requirements specified in MIL-STD-1472C.

12.1.a-03 ICON Subsystem Equipment mountings, fasteners, and labeling shall conform to the human engineering requirements specified in MIL-STD-1472C.

12.1.a-04 IF Switch Subsystem Equipment mountings, fasteners, and labeling shall conform to the human engineering requirements specified in MIL–STD–1472C.

12.1.a-05 DASCON Subsystem Equipment mountings, fasteners, and labeling shall conform to the human engineering requirements specified in MIL–STD–1472C as well as any requirements stated previously in this subsystem document.

12.1.a-06 DCON Subsystem Equipment mountings and fasteners shall conform to the human engineering requirements specified in MIL–STD–1472C.

12.1.a-07 Mechanical and Power Subsystem Equipment mountings, fasteners, and labeling shall conform to the human engineering requirements specified in MIL–STD–1472C.

12.1.a-08 Archive/Server Subsystem Equipment mountings, fasteners, and labeling shall conform to the human engineering requirements specified in MIL–STD–1472C.

12.1.a-09 Timing and Frequency Subsystem Equipment mountings, fasteners, and labeling shall conform to the human engineering requirements specified in MIL–STD–1472C.

12.1.a-10 Demodulator Subsystem Equipment mountings, fasteners, and labeling shall conform to the human engineering requirements specified in MIL–STD–1472C.

12.2 SAFETY

12.2.a The DAS system shall comply with the safety engineering principles applied throughout the design, development test, installation, checkout, and operation of the system.

12.2.a-01 The EMC Interface subsystem shall comply with the safety engineering principles applied throughout the design, development, test, installation, checkout and operation of the EMC Interface subsystem.

12.2.a-02 The Beamformer subsystem shall comply with the safety engineering principles applied throughout the design, development, test, installation, checkout and operation of the Beamformer.

12.2.a-03 The ICON Subsystem shall comply with the safety engineering principles applied throughout the design, development, test, installation, checkout and operation of the ICON Subsystem.

12.2.a-04 The DASCON Subsystem shall comply with the safety engineering principles applied throughout the design, development, test, installation, checkout and operation of the DASCON Subsystem.

12.2.a-05 *The DCON Subsystem shall comply with the safety engineering principles applied throughout the design, development, test, installation, checkout and operation of the DCON Subsystem.*

12.2.a-06 *The Mechanical and Power subsystem shall comply with the safety engineering principles applied throughout the design, development, test, installation, checkout and operation of the cabinet.*

12.2.a-07 *The Archive/Server Subsystem shall comply with the safety engineering principles applied throughout the design, development, test, installation, checkout and operation of the Archive/Server Subsystem.*

12.2.a-08 *The Demodulator Subsystem shall comply with the safety engineering principles applied throughout the design, development, test, installation, checkout and operation of the Demodulator.*

12.2.a-09 *The Timing and Frequency Subsystem shall comply with the safety engineering principles applied throughout the design, development, test, installation, checkout and operation of the Timing and Frequency Subsystem.*

12.2.a-10 *The IF Switch Subsystem shall comply with the safety engineering principles applied throughout the design, development, test, installation, checkout and operation of the IF Switch Subsystem.*

ABBREVIATIONS AND ACRONYMS

ACE	Advanced Composition Explorer
Ai	Inherent Availability
AM	Amplitude Modulation
A_o	Operational Availability
AWGN	Additive White Gaussian Noise
AXAF-1	Advanced X-ray Astrophysics Facility-Imaging
BIΦ-L	BI Phase –L
bps	bits per second
CCB	Configuration Control Board
CCSDS	Consultative Committee for Space Network Data Systems
CDB	Common Data Broadcast
C/N_o	Carrier-to-Noise Ratio
COTS	Contractor Off The Shelf
CW	Continuous Wave
DAS	Demand Access System
dB	Decibel
dBFS	Decibels referenced to Full Scale
dBm	Decibels referenced to one milliwatt
DCN	Document Control Notice
DIDs	Data Item Description
DRL	Data Requirements List
DSN	Deep Space Network
Eb/No	bit energy to noise power spectral density ratio
EMC	Element Multiplexer Correlator
EMI	Electro Magnetic Interference
GRGT	Guam Remote Ground Terminal
GSFC	Goddard Space Flight Center
GUI	Graphical User Interface
HOL	Higher Order Language

IBU	Independent Beamformer Units
ICD	Interface Control Document
IP	Internet Protocol
IOnet	Internet Protocol (IP) Operational Network
IPDU	IP Data Unit
kbps	kilobits per second
kb/sec	kilobits per second
kHz	kilo Hertz
KVA	kilo Volts Amp
LCM	Local Control and Monitor
LEO-T	Low Earth Orbiting-Terminal
LNA	Low Noise Amplifier
LOPs	Local Operations Procedures
LRUs	Line Replaceable Units
LSD	Logistics Support Depot
MA	Multiple Access
MAR	Multiple Access Return
MHz	Mega Hertz
μsec	microseconds
MIL-HDBK	Military Handbook
MIL-STD	Military Standard
MSFC	Marshall Space Flight Center
MTBF	Mean Time Between Failure
MTTR	Mean Time To Repair
NASA	National Aeronautics and Space Administration
NISN	NASA Integrated Services Network
NRZ-L, M, S	Non Return to Zero-L, M, S
Ns, nsec	Nanoseconds
O&M	Operations and Maintenance
PN	Phase Noise
P_E	Probability of Error
QPSK	Quadrature Phase Shift Keying

RFI	Radio Frequency Interference
rms	root mean square
SFDU	Standard Formatted Data Unit
SMTF	Software Maintenance and Test Facility
SN	Space Network
SNIP	Space Network Interoperability PN Codes
SNUG	Space Network Users Guide
SOS	“Save Our Ship”
SPEC	Specification
SQPN	Staggered Quadrature Phase Noise
SRD	System Requirements Document
STDN	Space Flight Tracking and Data Network
STGT	Second TDRSS Ground Terminal
TBD/TBR	To Be Determined/To Be Reviewed
TCP	Transmission Control Protocol
TDRS	Tracking and Data Relay Satellite
TDRSS	Tracking and Data Relay Satellite System
TGBFS	Third Generation Beamforming System
TOCC	TDRSS Operation Control Center (located at WSC)
WDISC	WSC TCP/IP Data Interface Services Capabilities
WSC	White Sands Complex (which consists of STGT, WSGT, and GRGT)
WSGT	White Sands Ground Terminal